16-28 FEBRUARY, 2022

# Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH
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# MISSING

## One-third of the country's recorded forests

**ENERGY**

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**AGRICULTURE**

**Long-term studies prove organic and natural farming profitable**

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## What is C-GINS?

C-GINS (Compendium of green infrastructure network systems) is the repository for best practices, projects and approaches in support of Green Infrastructure (GI) and Water Sensitive Urban Design and planning (WSUDP) principles. C-GINS is an open platform where the latest thinking on natural capital, ecosystem services and nature-based solutions is brought together.

It provides a knowledge marketplace, which showcases case examples of GI and WSUDP to simplify how we share, obtain and create knowledge to better manage our urban environment. Each of the case examples provides an overview of the intervention, timeline, authorities/ stakeholders involved in the project, outcomes and learnings tips for user education. The preference for sustainable technologies is mainly due to CSE's continuous motivation towards usage of sustainable and environmentally harmonious interventions.

## How can you contribute?

Becoming a contributor is a great way to share knowledge! If you are a practitioner working in the urban water sector and would like to exhibit your work on Blue-Green Infrastructure OR wish to submit an implemented case study, tell us and we will feature it on C-GINS, it gets updated every three months!

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# Consolidate clearances

I WROTE last fortnight that the bogey of green clearances feeds the false narrative of environment versus development, whereas the reality is these clearances are meant to put a check on the mindless and senseless development. Let me explain.

A few years ago I was member of a high-level committee, set up to examine the environmental clearances given to hydroelectric projects on the upper course of the river Ganga. You could argue that the projects were held up because of forest and environmental clearances, and thus the clearances were an impediment to development. But soon it became apparent that all projects had environmental clearance, albeit with some delay. Once built, these countless, back-to-back projects would not only re-engineer the mighty Ganga, but also dry it up in several seasons. This would make the fragile Himalayas, already at risk because of climate change, more vulnerable to landslides and devastations. The problem was not with hydropower—in fact, this is a clean source of energy, renewable and a huge resource of the Himalayas—but the mindless way these projects were being planned and given clearance, without paying attention to how many should be allowed and in what condition. So, is this a case of environment versus development, or just willfully bad development?

**Make environmental clearance part of a package that also strengthens systems of public participation and monitoring**

I write this to also reiterate the need for a robust, credible system of environmental scrutiny, to find the balance between environment and development, and to mitigate harm. An effective system, working for environmental integrity, would ensure these happen, both in design and in implementation.

So, what will make this system more effective? First, we need to accept that the system has become unnecessarily convoluted and must be streamlined. There is a need to consolidate all clearances—environment, forests, wildlife and coastal—so that the environmental impact assessment (EIA) is comprehensive. In the Budget 2022-23, the Finance Minister has announced a single-window clearance system. But because it is aimed solely towards the ease of doing business, it will further dilute this broken system. Therefore, the clearance system needs to be part of a package that simultaneously strengthens systems of public participation and monitoring.

Second, the process of public assessment must be deepened. I say this knowing that the task of listening to the community and its objections to the project can become as corrupt and compromised as the other parts of the system. Today, public hearings are held, not heard. We need to see this as a critical process; risks from projects get mitigated when community concerns are heeded and efforts are made to remediate and mitigate fallouts. So, going forward, the mandatory videography of the public hearing should be livestreamed. The committee assessing the project must be held to account that it has taken these concerns on board. To enable this, the monitoring and compliance conditions must be put in the public domain, and relayed back to the community.

Third, it is necessary to review the role of the environmental assessment committees—at the Centre and at the state. These committees are the weakest link in this process, as they are faceless and are not responsible for the compliance or monitoring of the project. It is a farce to say that the experts are independent. In fact, these committees make the government less accountable for the decisions that are taken during the scrutiny of the project. It is time these committees were disbanded and the process of assessment and monitoring be done by the central and state environment departments, which in turn needs to be strengthened in terms of expertise. But with this, the list of projects cleared or rejected and their conditions should be made public.

Then, the fourth and most critical agenda is to greatly strengthen the process of monitoring the project, post clearance. For this, there is a need to integrate the functioning of all agencies—from state pollution control boards to the coastal- and forest-related institutions. Currently, there are many agencies and yet enforcement is weak. The focus must be on monitoring for compliance. Otherwise, there is no point in this entire effort of assessing the impacts of projects.

But all this will not work unless baseline data about the project is credible and, again, publicly available. For this, the process of collecting updated information on different environmental parameters and on the ecological importance of the project site must be strengthened. This data needs to be publicly accessible so that when it is used in the EIA report, its credibility and scientific rigour can be gauged.

All this, and more, is only possible, if we believe that the process of project scrutiny has a value. Otherwise, these clearances will remain an exercise in futility, and government after government will take it down bit by bit to maintain the charade of environmental protection. DTE

@sunitanar

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**DESIGN TEAM** Chaitanya Chandan, Sanjit Kumar, Mukesh Kumar Singh, Shri Krishan, Ritika Bohra, Yogendra Anand
**PHOTOGRAPHER** Vikas Choudhary
**PHOTO LIBRARY** Anil Kumar
**PRODUCTION** Rakesh Shrivastava, Gundhar Das
**TECH SUPPORT** Rajendra Rawat, Jaidev Sharma
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**CONSULTING EDITOR** Anumita Roychowdhury

**Vol 30, No 19; Total No of Pages: 60**

Editorial, subscriptions and advertisements:
Society for Environmental Communications,
41, Tughlakabad Institutional Area,
New Delhi 110 062,

Phone: 91-11- 40616000, 29955124,
29956110, 29956394, 29956399
Fax: 91-11-29955879.
Email: editor@downtoearth.org.in

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Printed and published by Richard Mahapatra on behalf of Society for Environmental Communications. Printed at International Print-o-Pac Limited, B-204, 205, Okhla Industrial Area, Phase I, New Delhi-110020, India, and published at 41, Tughlakabad Institutional Area, New Delhi 110 062.

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**FOR ADVERTISEMENTS** Jyoti Ghosh
jghosh@cseindia.org

**FOR SUBSCRIPTIONS**
K C R Raja, raja@cseindia.org

**Cover design:** Ajit Bajaj | **Cover illustration:** Ritika Bohra

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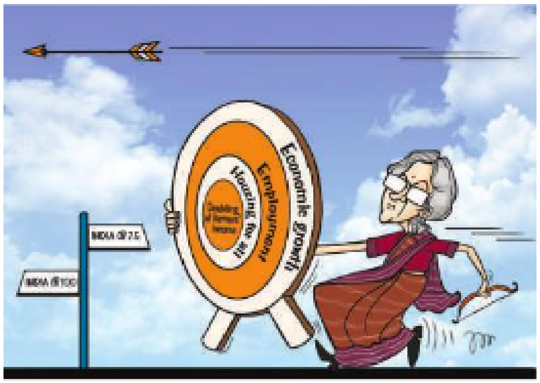
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54 Assam's fishing communities combine traditional knowledge and tools to overcome ecological challenges

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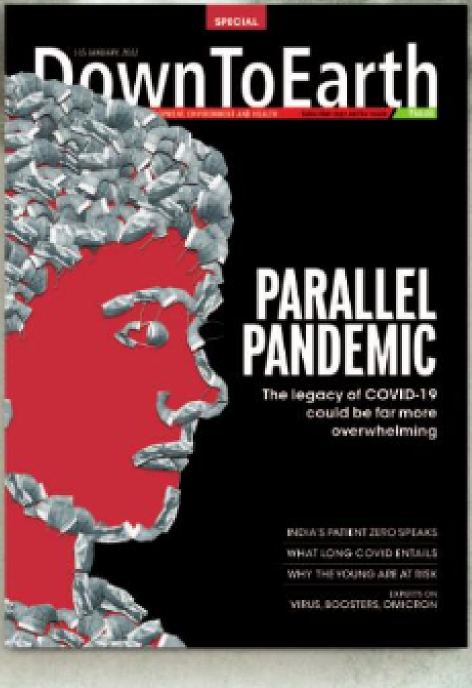
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# Engage

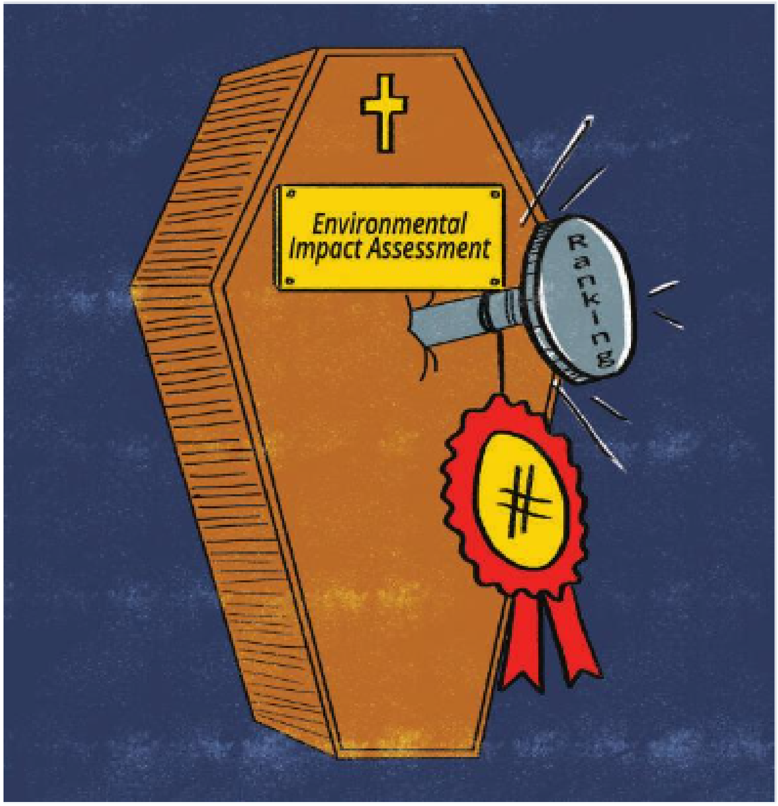

ILLUSTRATION: RITIKA BOHRA / CSE

## Green norms skewed toward development

This is in reference to the editorial "Our broken system of environmental clearance" (1-15 February, 2022). It correctly points out the sham going on in the name of environmental clearance. But it is not unexpected, since the concept of environmental impact assessment originated to ensure development by promoting trade-offs. Project proposals are rarely rejected on the back of adverse environmental impacts. Consultants hired by a project proponent will always try to prove that it has adequate environmental management systems to address all potential concerns and meet all the regulations. Moreover, environmental regulations in India do not even include cumulative impacts and provide for post-project environmental assessment. The whole exercise is designed, with the connivance of "experts", to hoodwink the local people who will be most affected by the environmental disruptions.

**SWAMI**
**VIA EMAIL**

## Why go after *petha*?

This is in reference to "Bitter sweet" (1-15 December, 2021). The article is not in good taste. Is there any production system in this country that does not cause pollution?

**SURENDRA PANDEY**
**VIA EMAIL**

## Right move

This is in reference to "Should electoral ID data be linked to Aadhaar?", published online on January 15, 2022. The article is not based on the right ideology or thought process. It is well proven by now that millions of bogus beneficiaries of various government schemes were identified and removed from the system after Aadhaar cards were linked to other government identification cards. Similarly, Aadhaar cards can help eliminate bogus voters. Only those who want to win elections through falsified votes oppose this move.

**DILIP PHANSALKAR**
**VIA EMAIL**

## Plastic in the water

This is in reference to the article "Why plastic piling in oceans post COVID-19 needs urgent attention", published online on October 6, 2021. It is true that in the future post-pandemic world, plastic trash will cause irreversible damage to the ocean. Moreover, India is more susceptible to the hazards due to its vast 7,516.6 km coastline and a variety of aquatic life. The country ranks 20th among 25 nations in the Plastic Management Index released by the Economist Group and Nippon Foundation's Back to Blue initiative. To perform better in plastic management and preserve the oceans, measures such as

segregation of plastic and general waste, recycling, enforcement of waste management regulations by governments and businesses and responsible public action are the need of the hour.

**MADISHETTI VISHAL**
**VIA EMAIL**

## Is South Africa out of the woods?

This refers to "South African and UK hospitalisation data: What it tells us about how deadly omicron is", published online on December 28, 2021. The slowing of Omicron cases in South Africa has give new cause for hope! The recent noticeable drop in new cases may be a signal that the country's dramatic Omicron-driven surge has passed its peak.

**LARRY MARTIN**
**VIA EMAIL**

*Down To Earth* welcomes comments and suggestions from readers in response to its articles and opinion pieces. We are introducing a "Pick of the Postbag" award, under which the letter adjudged the best will be highlighted and the winner will receive a free one-year digital subscription of the magazine. Letters may be e-mailed to *editor@downtoearth.org.in* or sent to:

The Society for Environmental Communications; 41, Tughlakabad Institutional Area; New Delhi-110 062. Letter writers should mention their full name, postal address and phone number.

**DTE TV**

### Indonesia's capital move

On January 18 this year, Indonesia passed a bill to move its capital from Jakarta to the East Kalimantan province, some 2,000 km away. The new capital will be called Nusantara or "archipelago". The reason behind this change, which was first proposed in 2019, is that Jakarta is "sinking" due to the large-scale digging of borewells for groundwater. What brought Jakarta to such a precarious state, and what impacts would this shifting of capitals have on the environment and people? Watch to find out.

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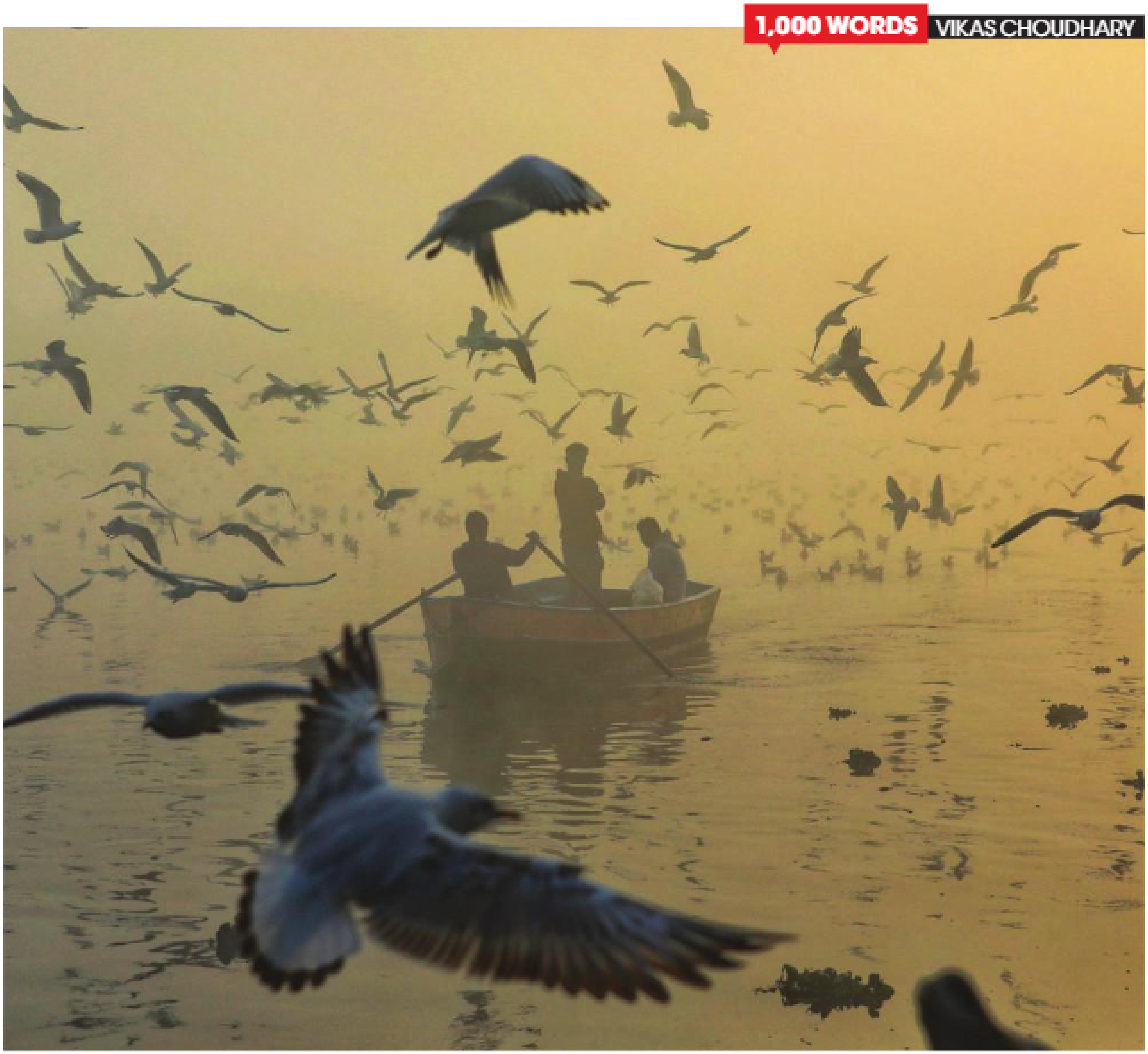
# Digest

**WHAT'S INSIDE**

Students of eight Delhi colleges step up for the welfare of stray animals in their vicinity **P10**

Global oil prices reach new heights as tensions escalate between Russia and Ukraine **P12**

**1,000 WORDS** VIKAS CHOUDHARY



Hundreds of thousands of seagulls migrate to India from Siberia every year at the onset of winter in October, settling on the banks of the Yamuna in Delhi until March. Seagulls have large brains and can quickly adapt to changes in living conditions. Industrialised fishing practices across the globe have reduced their natural food source and disturbed their nesting sites, and seagulls are increasingly making cities their permanent home. In the UK and Italy, there has been a perceptible increase in gull numbers in urban areas, with city residents not too enthused about their avian neighbours due to the noise from the bird colonies and cases of food snatching. The bird might find Delhi, where people at the river bank have a tradition of feeding them, just too inviting to move on.

FOR MORE PHOTOS, SCAN

# Canine carers

Students of eight colleges in Delhi mobilise to protect and care for stray dogs and other animals in their vicinity

**DAKSHIANI PALICHA**

**ONE EVENING IN DECEMBER 2020,** Mehak Saurabh got a call from her father, who had just rescued a dog from traffic in Gurugram. He noticed that the canine had a prolapsed rectum, and asked Saurabh for help.

Saurabh and her classmates, all students at Motilal Nehru College (MLNC) in Delhi, arranged for an ambulance and took the dog to a veterinary hospital. Later, Saurabh fostered the dog, whom she named Shadow, and arranged for multiple surgeries to treat its condition.

Although Shadow did not survive, it was given a fighting chance thanks to Saurabh and her classmates, who are all members of The Desi Club. Started by MLNC students, it is an initiative that works for the welfare of stray animals through rescue and adoption operations, and vaccination and sterilisation drives. "During the one year (2020-21) that I led the rescue operations of the club, we rescued some 20 stray dogs, two cats and even a calf," says Saurabh, who is pursuing a bachelor's degree in English. She now heads the 30 student members of The Desi Club.

The initiative was not always aimed at mobilising large-scale ground action, but rather just to encourage students to care for the seven or eight stray dogs that lived on the MLNC campus, says Tripti Sharma, co-founder of the club and a student of History and Sanskrit. The club was started by student members of Enactus, an organisation working towards social entrepreneurship, in 2014. Its name is derived from the Enactus club's Project DESI (Duty to Empathise, Sterilise and Immunise stray dogs), she adds. "However, it was inactive for a few years before I enrolled in the college. During my first year, my faculty advisor suggested I restart the initiative," recalls Sharma. She and another student, Lakshita Shee, officially relaunched the club in 2019.

"We wanted to take it beyond the college campus and encourage students to find and take care of all stray dogs near their home and other surroundings. The next step was vaccination and sterilisation, for which we partnered with Delhi-based non-profit People for Animals and other organisations working for similar causes," she adds. More than 1,000 stray animals have undergone immunisation and sterilisation so far, Sharma estimates.

Members of The Desi Club fund these drives by winning grants and competitions opened by non-profits and companies under their corporate social responsibility initiatives. "For instance, a part of the funds for sterilisation come from a grant Enactus members received from The Pollination Project, a global funding platform. Uttar Pradesh-based non-profit Nishabd helps with vaccination," she says.

To extend its reach, The Desi Club MLNC has also inspired seven other colleges in Delhi to start their own initiatives. "The MLNC club helps guide us on conducting the various drives and operations," says Preyksha Panday, head of The Desi Club at Jamia Millia Islamia.

This year, the clubs plan to inspire youth to take up the cause themselves through talks, webinars and social media campaigns as well, says Saurabh. The goal is to make it a pan-India initiative.

Shailai Tandon (left) and Harnoor Chahal, students of Motilal Nehru College, Delhi

## BITS GLOBAL

**Geopolitical tensions** between Russia and Ukraine escalated in the last week of January, as 100,000 Russian troops gathered at the Ukrainian borders. Resulting disruptions to global oil supply chains sent the benchmark soaring to US $91 a barrel. European experts have hinted at an energy crisis if tensions persist and Russia halts oil supply.

**Tropical storm** Ana hit Madagascar on January 22 and proceeded to Mozambique two days later, with Malawi, Uganda, Zambia, Zimbabwe and South Africa seeing heavy rainfall, floods and landslides. Two weeks later, on February 5, Cyclone Batsirai made a landfall in Madagascar, killing at least 10 people and displacing nearly 48,000 others before weakening on Sunday.

**Australia on** January 28 pledged US $700 million in funding to restore the Great Barrier Reef. Prime Minister Scott John Morrison said the investment will be aimed to reduce pollution of the reef's waters and curb illegal fishing. Climate activists criticise the move saying the goals do not address threats such as reef bleaching due to global warming.

**The Greek** government on January 30 faced a no-confidence motion in parliament on the back of its poor management of a snowstorm that hit the country in the last week of the month. The cold snap left thousands of people across Athens and the nation's islands stranded, drawing widespread outrage.

**An oil** spill in eastern Ecuador reached a protected nature reserve in the Amazon rainforest on January 31, polluting a river that supplies water to indigenous communities in the region. The government said the waters of the Coca river, one of the biggest in the Amazon, can no longer be used for human and animal consumption.

## BITS INDIA

**Farmers in** Punjab, Haryana and Uttar Pradesh observed a "betrayal day" on January 31 against the Union government's failure to uphold promises made after farm unions called off their agitation against the three national farm laws. The farmers said the Centre has neither constituted a committee to assure minimum support price, nor compensated the kin of the farmers fatally injured during the protests.

**Forest officials** recorded the deaths of more than 130 grey pelicans in Telineelapuram village, Srikakulam district, Andhra Pradesh, in January. The cause of death is nematode infestation. Grey pelicans fall in the 'Near Threatened' category of the International Union for Conservation of Nature's Red List and come to Andhra Pradesh from Siberia during winters for breeding.

**The Maharashtra** government in the last week on January greenlit a ₹24 crore dedicated water supply project in the state's Kalyan *taluka*, ending the years-long water woes of 15 villages. Under the project, every household will get a pipeline connection and pay a water tax, with supply being lifted from the Ulhas river in the district.

**Green Growth** Equity Fund, India's largest climate impact fund, has secured US $741 million in funding, making it the world's largest single-country climate changed-focused fund. Run by financial investment firm EverSource Capital, the fund will focus on meeting India's renewable energy targets.

## IN COURT

### NATIONAL GREEN TRIBUNAL

- In a matter on illegal operation of polluting dairy farms in a residential colony in Ghaziabad, Uttar Pradesh, the National Green Tribunal (NGT) condemned state officials and sought a response from them for failing to prevent the situation and delaying action despite repeated orders.

- NGT directed district officials and the Central and state pollution control boards to look into the complaint raised by residents of Hansol village, Ahmedabad, Gujarat, against the dumping of animal corpses and chemicals into the Sabarmati river.

### SUPREME COURT

- The apex court directed the Municipal Commissioner of Mumbai to review the status of the city's project to set up and upgrade sewage treatment plants across seven areas. The court noted that the project has seen several delays, driving up costs.

### HIGH COURT

- The High Court of Jammu and Kashmir and Ladakh, hearing a public interest petition, sought a reply from the Union Ministry of Environment, Forest and Climate Change on preservation of wetlands in the region under the Ramsar Convention.

### So far...

Number of cases on environment and development tracked from January 1 to February 1, 2022

| NATIONAL GREEN TRIBUNAL | SUPREME COURT | HIGH COURTS |
|---|---|---|
| 47 | 12 | 15 |

FOR DETAILED VERDICTS, SCAN

By Dakshiani Palicha, Susan Chacko, Shuchita Jha and Avantika Goswami

# WHITHER AMRIT KAAL

The Union Budget 2022-23 did not talk about the developmental targets promised for this year under the Strategy for New India@75, but set the country on a new journey of hope till 2047

**RICHARD MAHAPATRA, KIRAN PANDEY, SHAGUN, AKSHIT SANGOMLA, ANUMITA ROYCHOWDHURY** NEW DELHI

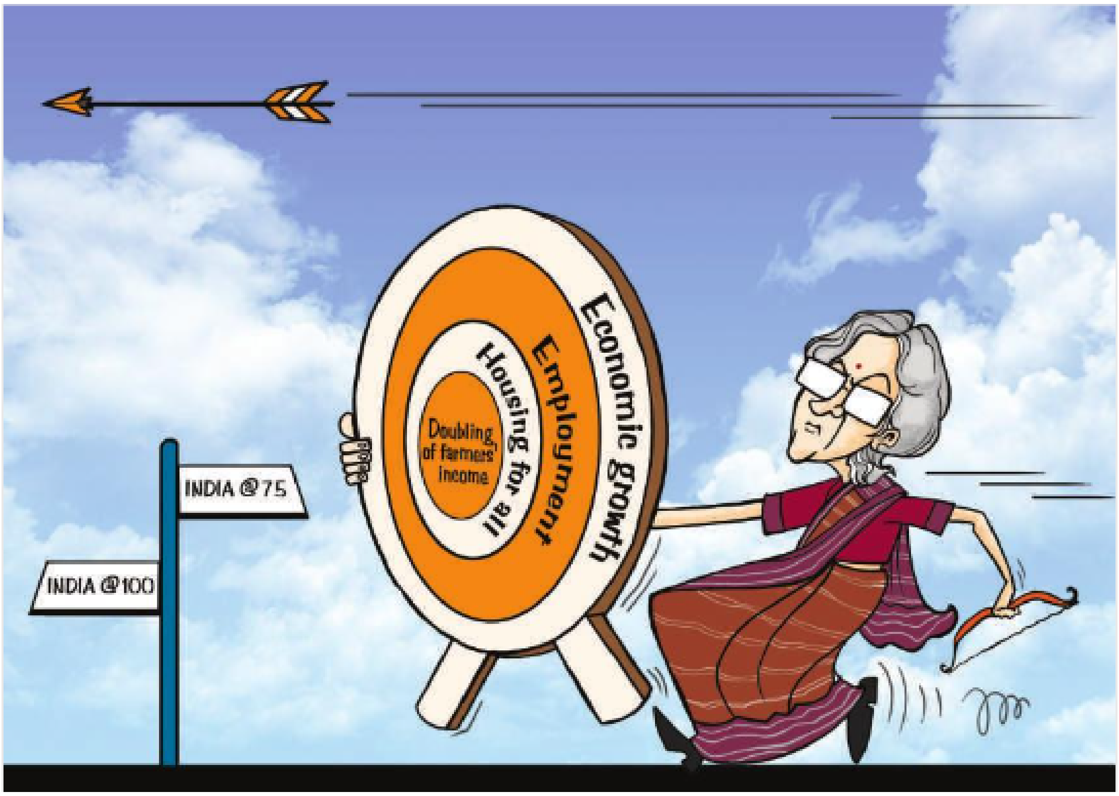


ILLUSTRATION: SORIT GUPTO / CSE

THE UNION Budget 2022-23 was anything but what a budget should be. It gave a grand idea of the future, but not much of this intent was translated into monetary provisions. After Union Finance Minister Nirmala Sitharaman ended her speech—her shortest so far—on the floor of Parliament, a phrase she repeatedly used trended on social media: *amrit kaal*, which loosely translates to "era of elixir". "This Budget seeks to lay the foundation and give a blueprint to steer the economy over the *amrit kaal* of the next 25 years—from India at 75 to India at 100," said Sitharaman in her speech. With this preamble, one can only read or analyse the budget in future terms, which themselves have not been defined.

Expectations from this budget were already fuelled by the promise of a "New India" in 2022 or "India@75". 2022 is the year the government is due to fulfil the promises defined in the NITI Aayog's "Strategy for New India@75" announced in 2018. From becoming a US $4 trillion economy to generating employment for women, doubling farmers' income and eradicating poverty, there are some 41 targets under this strategy, of which at least 17 have a deadline in 2022.

But according to an analysis of all government data, published in *Down To Earth*'s "State of India's Environment 2022" report, the country is likely to miss nearly all the targets because of slow progress. Thus, the Union Budget 2022-23 and the *Economic Survey 2021-22* were eagerly awaited to understand where the country stood.

But it seems this review was given a pass, with the government directly taking us into the *amrit kaal* and supposedly extending all "New India" targets to 2047, the centenary year of India's Independence. Neither the budget speech nor the allocation tables mentioned the targets promised under the "India@75" strategy. Sitharaman did not even bring up doubling of farmers' income, the biggest and most critical target to be met this year. The size of the economy was also not talked about, although the finance minister said to various media outlets later that India was headed to being a $5 trillion economy.

## NOWHERE NEAR GOALS

The main target for the "India@75" vision is to increase per capita income from $1,900 in 2017-18 to $3,000 in 2022-23. Achieving the "New India" goal as a whole is conditional to this income growth, which according to the vision strategy would "enable us to achieve freedom from squalor, illiteracy, corruption, poverty, malnutrition and poor connectivity for the common Indian."

Latest Union government data for 2021-22 shows that India's per capita income is around $1,258 (₹93,973)—lower than in 2017-18. In the last two years, the pandemic accelerated the country's economic slowdown that started in 2016. To reach a $3,000 per capita income level in the next 70 weeks, we have to more than double the current figure. This entails unmatched economic growth, a miracle.

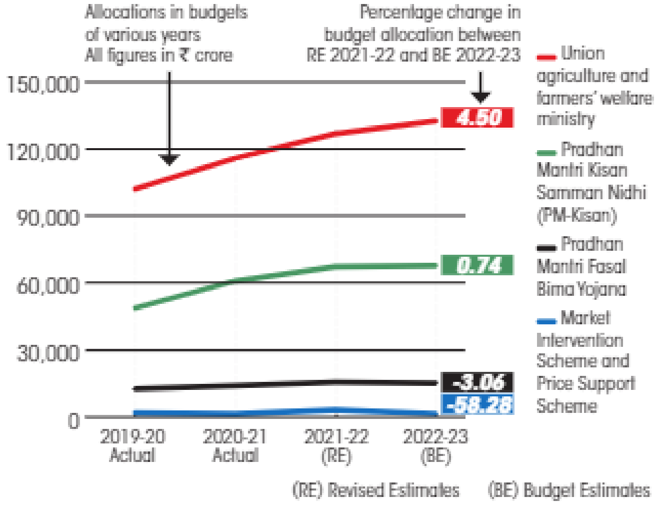
To increase per capita income and thus the size of the overall economy, the "India@75" vision targets include raising the employment level, and in particular increasing female labour participation rate to at least 30 per cent by 2022-23. Going by government data, this figure was just 16.9 per cent in January-March 2021. According to December 2021 data with the Centre for Monitoring Indian Economy, 23 per cent of the 35 million unemployed people in the country actively seeking jobs are women.

Another critical indicator for "India@75"—pivotal to the per capita income growth—is the increasing of India's GDP (gross domestic product) to $4 trillion by March 31, 2023. This is short by $1.5 trillion by the end of 2021 fiscal. Rather, poverty levels have

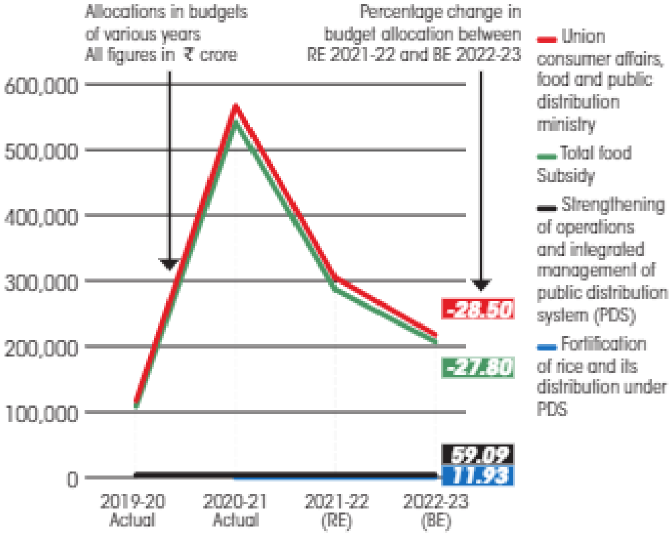
## KEY NUMBERS

What the budget allocated, and how the figures compare with previous years:

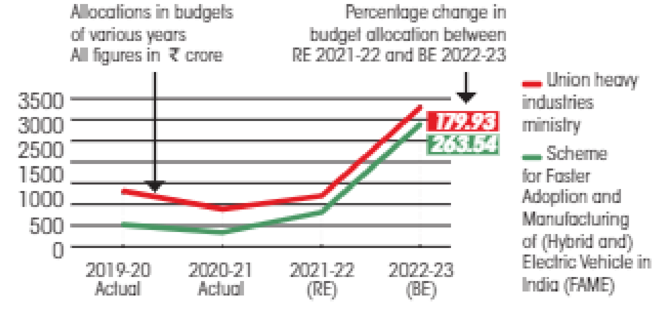
### Agriculture: Dip for price support schemes



### Food: More focus on public distribution

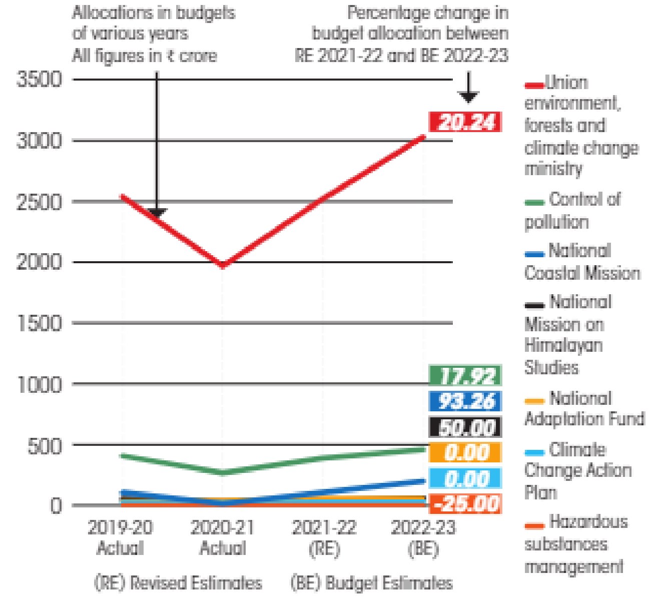


### Heavy industries: FAME ramped up

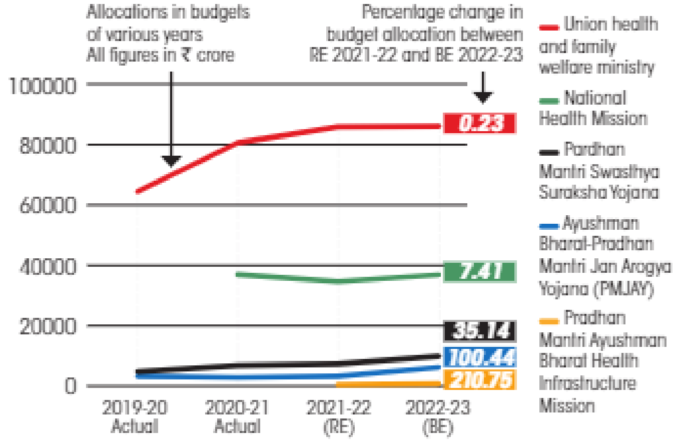


Source: Union Ministry of Finance

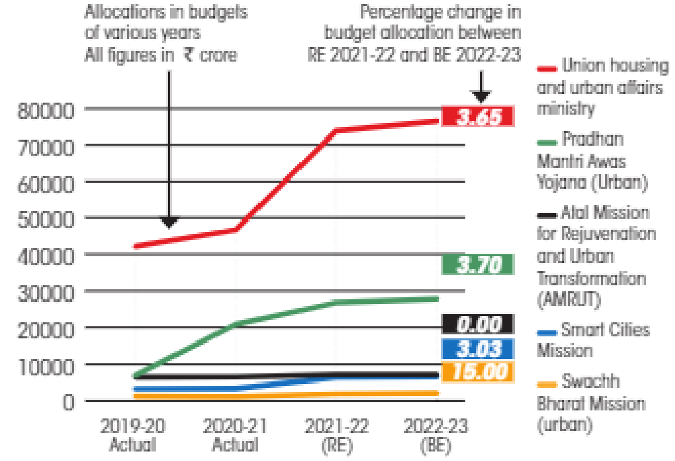
**Environment: Sizeable increase for some schemes**



**Health: Boost for infrastructure**



**Housing: Marginal rise for urban schemes**



Source: Union Ministry of Finance

increased in India, even though there is no official estimate since 2011. In December last year, the NITI Aayog released an index that used health, education and standard of living to gauge poverty levels and their intensity. It says 25.01 per cent of India's population suffers from multidimensional poverty.

The next promise for "New India" is to double farmers' income from the 2015-16 level by 2022. The recently released "Land and Livestock Holdings of Households" and "Situation Assessment of Agricultural Households" reports, under the 77th round of the National Sample Survey, have some indicators on whether this promise can be kept. The monthly income of agricultural households has increased by 59 per cent since 2012-13—an annual growth rate of 7.8 per cent. But to get a real sense of this growth, one must factor in the annual inflation rate, which makes the growth rate just 2.5 per cent.

"As such, the target income for doubling by 2022 is ₹21,146 per month (taking inflation also into account)," said the Alliance for Sustainable and Holistic Agriculture or ASHA, in a statement. However, the estimated monthly income of farm households in 2018-19 was ₹10,218 per month in nominal terms, as the "Situation Assessment Survey of Agricultural Households" shows. "This was the sixth year of doubling of farmers' income. The previous five budgets had long poems about this target but now, when it was about accounting for those six years, there was silence," said farm union Jai Kisan Andolan's founder Yogendra Yadav.

The overall allocation for the agriculture sector in the Union Budget 2022-23 increased marginally to ₹132,513.62 crore from the 2021-22 revised estimates (RE) of ₹126,807.86 crore. However, the Market Intervention Scheme and Price Support Scheme (MIS-PSS) was allocated ₹1,500 crore—62 per cent less than the ₹3,959.61 crore in the RE of the last financial year. The Pradhan Mantri-Annadata Aay Sanrakshan Abhiyan (PM-AASHA) saw an even deeper cut. It was allocated just ₹1 crore as against an expenditure of ₹400 crore in 2021-22. Both schemes ensure procurement on minimum support price, especially for pulses and oilseeds.

## CLIMATE, FRONT AND CENTRE

The budget this year has put climate action at the core of India's "transformative" phase of development till 2047. The focus on energy transition, climate action and electrification is encouraging, but needs committed strategy and upscaled funding. There are several strands in the new budget, which, if implemented at scale, can augment the progress on clean air and low carbon gains.

Sitharaman in her budget speech has announced four priority areas—productivity enhancement and investment; sunrise opportunities; energy transition; and climate action. Clean energy has been taken in contexts as diverse as empowerment of women, setting up of data centres and electrification of remote border villages.

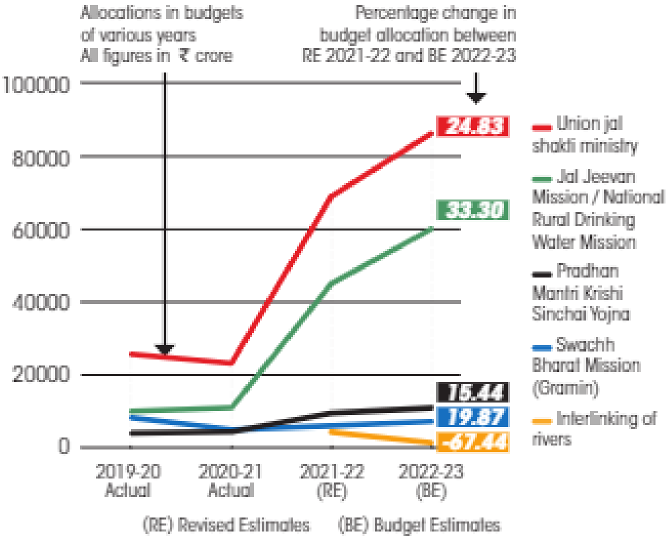
"To facilitate domestic manufacturing for the ambitious goal of 280 gigawatt installed solar capacity by 2030, an additional allocation of ₹19,500 crore for production-linked incentive for manufacture of high efficiency modules, with priority to fully integrated manufacturing units from polysilicon to solar PV modules, will be made," said Sitharaman.

But the declarations fall flat after a closer look at the budget documents. The budget estimate for the Union Ministry of New and Renewable Energy for 2022-23 shows that investment in Solar Energy Corporation of India (SECI), the only public sector undertaking working on solar energy, has been nearly halved—to less than ₹1,000 crore from over ₹1,800 crore.

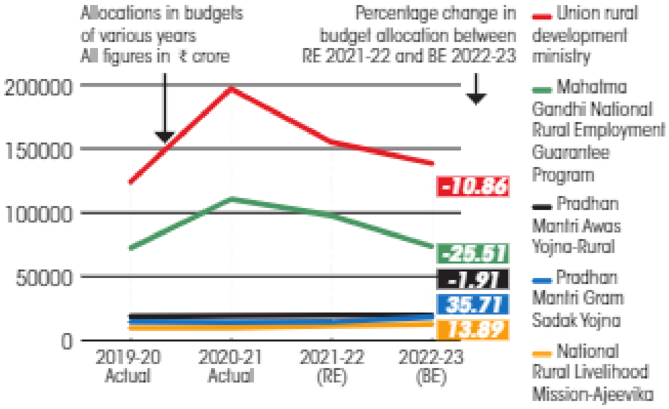
There were great expectations regarding electric mobility, and the budget puts out good intent here. Interestingly, the deployment of electric vehicle programmes has been linked explicitly with urban planning strategies of zero emissions public transport and low emission zones. A battery swapping strategy has also been proposed to overcome the limitation of land-constrained cities. The private sector is expected to develop business models for "Battery or Energy as a Service" to improve the electric vehicle ecosystem. Dense charging infrastructure has been proposed as part of the harmonised infrastructure development for energy storage, grid scale battery system for renewable energy and data centres. Though this is encouraging, the budget is again silent on the zero emissions target and mandate.

It is now understood that the proposed schemes require huge private sector investment. This can only be viable if market demand is stimulated with sustained targets to bring more certainty in investment decisions. This is also needed to be consistent with India's signing of zero emissions vehicle pledge in Glasgow. But private investment can be hugely uncertain if the target and zero emissions mandate do not provide the milestones. DTE @down2earthindia

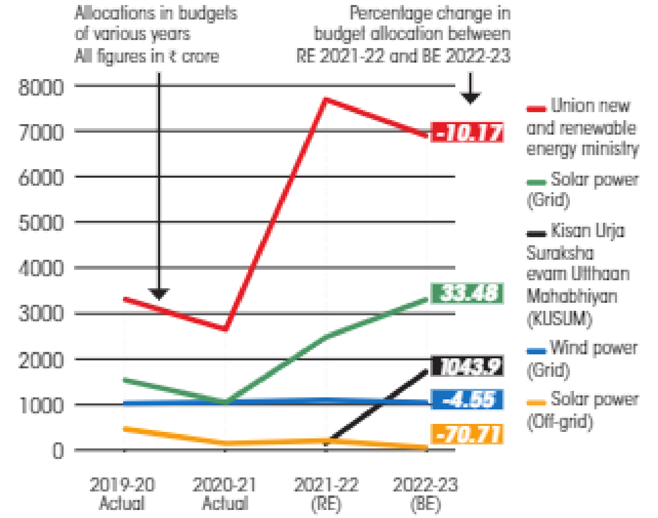
**Water: Significant increase in overall allocation**



**Rural development: Dip in overall allocation**



**Renewable energy: Focus on solar power**



Source: Union Ministry of Finance

#1 APPRAISAL AUTHORITY

ILLUSTRATION: RITIKA BORA

# Rewarding incompetence

India's new star-rating system to promote state agencies that give hasty environmental clearances to projects

**ANUBHA AGGARWAL**

NEW DELHI

ON JANUARY 17, 2022, the Centre rolled out a star-rating system for state environmental clearance authorities to make them more efficient, transparent and accountable. A closer look, though, suggests that the rating system, instead, penalises the state environment impact assessment authorities or SEIAAS, for adhering to the Environmental Impact Assessment (EIA) notification, 2006, the blueprint for giving green nod to projects.

The rating system, to be updated every month, is based on seven parameters and they are geared towards pressurising SEIAA to fast-track clearances—even if it means without due diligence. Under the first parameter, state agencies that, on average, clear projects in less than 80 days will be awarded two points. If the average time drops to 105 days, the recommended period under the 2006 EIA notification, 1 point gets deducted. If an agency has an average turnaround time of 120 days or more, it will not be awarded any points (see 'Partial assessment').

While the Union Ministry of Environment, Forest and Climate Change (MoEFCC) justifies the stricter timeline on the basis that the entire clearance process is now online and hence faster, almost all of the remaining parameters, worth 1 point each, push SEIAAs to avoid critical procedures, such as conducting site visits and asking for additional information, to save time. Some of these parameters can change the nature of EIA from being a safeguard for shared resources to becoming a token step in the process of doing business.

Under the EIA notification of 2006, all projects are put into two categories, A and B, depending on their potential impact on human health and the environment. Category A projects pose higher risk than category B and are cleared by MoEFCC, based on the recommendations of an expert appraisal committee. Category B projects are cleared by SEIAA, based on the recommendations of the state expert appraisal committee. There are four broad steps involved in the environmental clearance process of category B projects. First is the screening process, where project proponents need to submit an application with the state agency that determines if an EIA is needed for the project. This is followed by the scoping step, where the agency determines the terms of reference for the project. The third step involves preparation of a draft EIA report which is shared with stakeholders for comments. Finally, in the appraisal stage, the project is scrutinised in light of the comments and it is either recommended or rejected.

## PARTIAL ASSESSMENT

New rating system for state environmental assessment authorities only looks at ways to fasten the clearance, even if it means ignoring due diligence

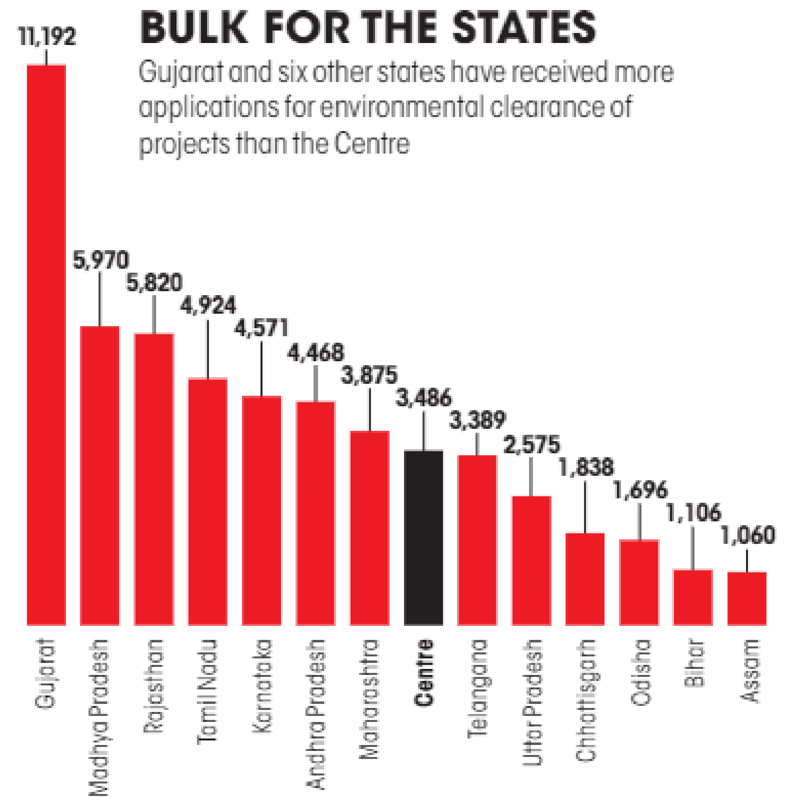
| Parameters | Weightage | Score |
|---|---|---|
| Average number of days for granting environmental clearance | 2 | 0 if >120 days taken;<br>0.5 if 105-120 days<br>1 if <105 days<br>2 if <80 days taken |
| Per cent disposal of fresh terms of reference or amendment proposals awaiting for more than 30 days | 1 | 0 if <80 %;<br>0.5 if 80-90%<br>1 if > 90% |
| Per cent disposal of fresh environmental clearance/amendment proposal amendment awaiting for more than 105 days | 1 | 0 if <80 %;<br>0.5 if 80-90%<br>1 if > 90% |
| Percentage of cases wherein more than one time essential details were sought by state agency | 1 | 0 if < 30 %;<br>0.5 if 20%<br>1 if > 10% |
| Average number of days taken for accepting the proposals for terms of reference/ environmental clearance | 1 | 0 if < 5 days;<br>0.5 if 5-7 days<br>1 if > 7 days |
| Complaints redressed by state environmental impact assessment authorities | 1 | 0 if < All complaints;<br>0.5 if 50% of more<br>1 if > 50% |
| Percentage of cases out of total cases placed to state expert appraisal committee, for which site visits were carried out | 1 | 0 if < 20 %;<br>0.5 if 10-20%<br>1 if > 10% |

Source: Union Ministry of Environment, Forest and Climate Change

One of the parameters under the ranking system penalises state agencies if they ask the project proponents for essential details, which are additional information needed to understand the environmental cost of the project. If it wants to meet the parameter, a state agency can ask for essential details only once in less than 10 per cent of the applications. If essential details are sought in more than 30 per cent of the cases, then the agency will not be awarded any points under the parameter. As per the 2006 notification, SEIAAs can ask for essential details at the screening, draft EIA and appraisal stages and there is no cap on the number of times such a request can be made. Even MoEFCC admits that it is an important provision that deters project proponents from furnishing incorrect information. On February 22, 2021, MoEFCC said essential details should be sought during project appraisal due to the "non-compliance of terms of reference by the consultants/project proponents" while conducting EIA. The same message was reiterated on March 15, 2021, when another circular by the Union ministry said, "the need to seek Essential Details arises due to lack of diligence on the part of the project proponents/consultants while submitting proposal for grant of Environmental Clearance".

The new ranking system also dissuades state agencies from conducting site visits. Under EIA 2016, an agency, state or central, has the discretion of conducting site visits "wherever necessary" to ensure due-diligence before granting clearances. The ranking says agencies that conduct site visits in less than 10 per cent of the projects will be awarded 1 point. Agencies that conduct site visits in 20 per cent or more projects will not get any points under this parameter. There is no data available on how frequently agencies carry out site visits, and even MOEFCC is silent on how it decided 10 per cent as the acceptable limit. The rating system additionally grades state agencies on the time they take to accept applications, prepare terms of reference and redress complaints, and the rate at which they dispose of cases pending for over 105 days.

"It is difficult to understand the motive behind the ratings. If they are serious, they should strengthen the expert appraisal committees. In contrast they are killing important processes which were envisaged to reduce the environmental impact of projects," says Nivit Kumar Yadav, director of the Industrial Pollution Unit in Delhi-based non-profit Centre for Science and Environment. The impact of the ranking on the environment is going to be considerable as several SEIAAS deal with more projects than the Centre. MOEFCC has received 3,486 applications between July 2014 and January 2022. In contrast, Gujarat has received 11,192 applications in the same period. Six other states have also received more applications than the Centre ('Bulk for the states').


**BULK FOR THE STATES**

Gujarat and six other states have received more applications for environmental clearance of projects than the Centre

Includes only fresh/new proposals submitted for environmental clearances between July 2014 and January 2022

Source: Parivesh, Union Ministry of Environment, Forest and Climate Change

## REPEATED DILUTION

The industry and the government view EIA as a bottleneck in the ease of doing business. This is the reason MOEFCC has repeatedly tried to dilute the process it has created.

In July 2021, the Union government released a weak standard operating procedure on how to deal with projects that violate EIA. The guidelines, an outcome of a National Green Tribunal order, levy meagre penalties on violators and, more alarmingly, allow projects to continue their violations, as long as they are paying their fines.

In November 2020, MOEFCC amended EIA 2006 to exempt thermal power plants from applying for clearances every time they change their type or source of coal. This is surprising as the quality of coal and the distance it takes to transport them to the plant have a major impact on the environmental footprint of the project. Under EIA 2006, thermal power plants were allowed to use raw or blended coal that had an ash content of up to 34 per cent. In May 2020, the Union ministry removed this clause and allowed the use of unwashed coal, which generates more fly ash, a highly toxic by-product of coal burning.

In January 2020, MOEFCC exempted projects from applying for fresh environmental clearances even if they change "raw material-mix or product-mix, change in quantities within products or number of products", as long as the "resultant increase in production is not more than 50 per cent of the production capacity permitted in the earlier environmental clearance". They now require only a certificate from the state pollution control board verifying the project's pollution load has not increased.

"The way frequent changes are being carried out, India needs an Environmental Impact Assessment Act which will allow deliberation at all the levels," says Yadav. Otherwise, environmental clearances, which are a preventive process, will fail to safeguard the environment and the social well-being. DTE

@down2earthindia

# Himalaya Wellness Committed to Preserving Biodiversity

Being a leading global healthcare brand, Himalaya Wellness Company is conscious of the need for sustainability and has pledged to conserve biodiversity through several initiatives. One of the major initiatives is the tree plantation drive being conducted since 2012.

India, an extremely biodiverse country, has over 45,000 species of plants in 2.4% of the world's land area . However, many life forms are at risk due to rapid urbanization and development activities; hence prioritizing and preserving biodiversity is the need of the hour. Since 2012, Himalaya Wellness Company has planted over 8,00,000 trees across the Western Ghats, Meghalaya, the Eastern Ghats, and Bengaluru. The local communities are then handed over the plantation that helps them earn a livelihood.

Saplings of fruit and vegetable-bearing, fodder-providing, and nitrogen-fixing trees are planted in rural communities. This gives the local communities complete autonomy of the plants and the produce, which they may either use for economical upliftment or for personal consumption.

Himalaya also worked on building eco-villages to generate sustainable farming or secondary livelihood options. The Khasi tribes in Meghalaya were trained for beekeeping, vermicomposting, and mushroom cultivation.

Globally, we are facing a huge environmental crisis, and the time to act is now. Himalaya pledges to restore and preserve biodiversity and keep working towards protecting our Mother Earth. This is the way to make the world a better place to live!

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[1] *https://india.mongabay.com/2020/09/nature-in-peril-as-biodiversity-losses-mount-alarmingly-states-the-living-planet-report/*

# Charged up

Battery makers are moving beyond lithium to power India's clean energy ambitions

**ROHINI KRISHNAMURTHY**
NEW DELHI

INDUSTRIALIST MUKESH Ambani, chairperson and managing director of Reliance Industries Ltd, ended 2021 on a high note by acquiring UK-based battery technology firm Faradion Limited for £100 million (approximately ₹1,001 crore). His refining-to-retail conglomerate has placed its bets on Faradion's sodium-ion batteries to realise its goal of setting up four gigafactories in the country to manufacture solar panels, electric batteries and hydrogen fuel cells. More than a business strategy, the deal indicates a changing trend in India's battery technology ecosystem.

The battery technology industry has seen a rapid growth in recent years as countries increasingly switch to clean-powered electric mobility. Currently across the world, four types of batteries are in

use: lead acid, lithium-ion (including variants), nickel-metal hydride and vanadium ion batteries. While lead acid and lithium-ion batteries are the only two currently available in the Indian market, several other technologies like vanadium redox, metal-air, metal-ion and liquid metal batteries are also being explored for application across sectors.

Parveen Kumar, senior programme manager, Electric Mobility at the World Resources Institute, a global research non-profit, tells *Down To Earth* (DTE) that four factors determine whether a new battery technology disrupts the market—energy density (amount of charge in a unit area), cost, safety (health impacts, flammability and explosiveness) and sustainability (including global availability).

For instance, lead acid batteries have been in use for long, and continue to be an economical option with supply chains already in place. However, they pose a potential threat to health and the environment if improperly discarded. According to the World Health Organization, lead is a naturally toxic metal, which if ingested or inhaled in large quantities can cause anaemia, brain and organ damage and even death. Further, adds the UN Environment Programme, lead is also a pollutant, and improper disposal or recycling of batteries can dispel toxic fumes in the air, soil and water. These batteries also have a low energy density of 50-80 Watt-hour (Wh) per kg, according to US-based sustainability non-profit Environmental and Energy Study Institute.

Lithium has some environmental cost by way of mining, but it is considered a cleaner option when compared with lead-acid batteries.

Lithium-ion batteries have a density of 100-265 Wh per kg, according to the Clean Energy Institute at the University of Washington, US. This ability to achieve higher energy densities allows its use in smaller batteries, making it attractive for electric vehicles, says N Kalaiselvi, director at the Council of Scientific and Industrial Research-Central Electrochemical Research Institute (CSIR-CECRI). This is why the global battery market has been dominated by lithium-ion batteries. According to US-based market analysis firm Navigant Research, lithium-ion batteries accounted for 85.6 per cent of deployed energy storage systems as of 2015.

India, too, has taken steps to facilitate the shift—the Centre in 2021 approved a ₹18,100 crore Production Linked Incentive Scheme for manufacturing, export and storage of lithium-ion cells.

But the lithium-ion battery also has limitations. It is expensive, with reserves localised only in certain parts of Chile, Australia, Argentina and China. Further, China controls 80 per cent of the world's lithium refining and 77 per cent of the world's cell capacity, according to data from BloombergNEF, increasing other countries' dependence on it (see 'Charging', DTE, 1-15 April, 2021). Also, these batteries run the risk of exploding if they overheat.

Therefore, as the latest Reliance-Faradion deal shows, the global battery technology market appears to be diversifying from lithium as well.

## SODIUM POTENTIAL

Even though sodium-ion batteries have not entered the market yet, "research has shown that they are a potential candidate [for batteries] and Reliance has rightly identified an opportunity," says Akanksha Tyagi, programme associate at Delhi-based think tank Council on Energy, Environment and Water (CEEW). Faradion is not the only player working on this technology. China's Contemporary Amperex Technology Co Limited (CATL), dubbed as the world's largest electric-vehicle battery company, plans to have a sodium-ion battery supply chain up and running by 2023.

CSIR-CECRI also has sodium-ion batteries in the pipeline. The institute is in the midst of setting up a laboratory in Karaikudi, Tamil Nadu, and is planning to introduce a lithium-ion battery prototype made with tweaks to the manufacturing process in the next 18 months, says director Kalaiselvi.

Sodium-ion batteries have three essential components: a negatively charged anode made up of hard carbons; a positively charged cathode constituting sodium-containing layered materials; and an electrolyte that allows electrons to move. They work in a similar manner to lithium batteries. When the batteries are in a charging state, sodium atoms in the cathode become ions by releas-

**SODIUM IS AVAILABLE IN MORE ABUNDANCE THAN LITHIUM AND CONSIDERED TO BE SAFER AS WELL. HOWEVER, SODIUM-ION BATTERIES FALL SHORT IN TERMS OF ENERGY DENSITY, HINDERING THEIR POTENTIAL USE IN ELECTRIC VEHICLES**

ing electrons. These ions flow through the electrolyte while the electrons move through an external circuit to reach the anode. During the discharge state, the reverse happens—from anode to the cathode.

There are several factors that influence the growing favourability of sodium over lithium (see 'Power play'). First, the element is abundant in nature—the Earth's crust has 2.9 per cent of the element while lithium's share is only 0.01 per cent. Sodium can be found naturally in seawater and also mined from soda ash. The US holds the highest reserves of soda ash, followed by Turkey and Botswana. The cost of extracting sodium is at least 20 per cent lower than lithium, says a March 2021 article in IEEE *Spectrum*. Kumar says sodium is also relatively safer than lithium.

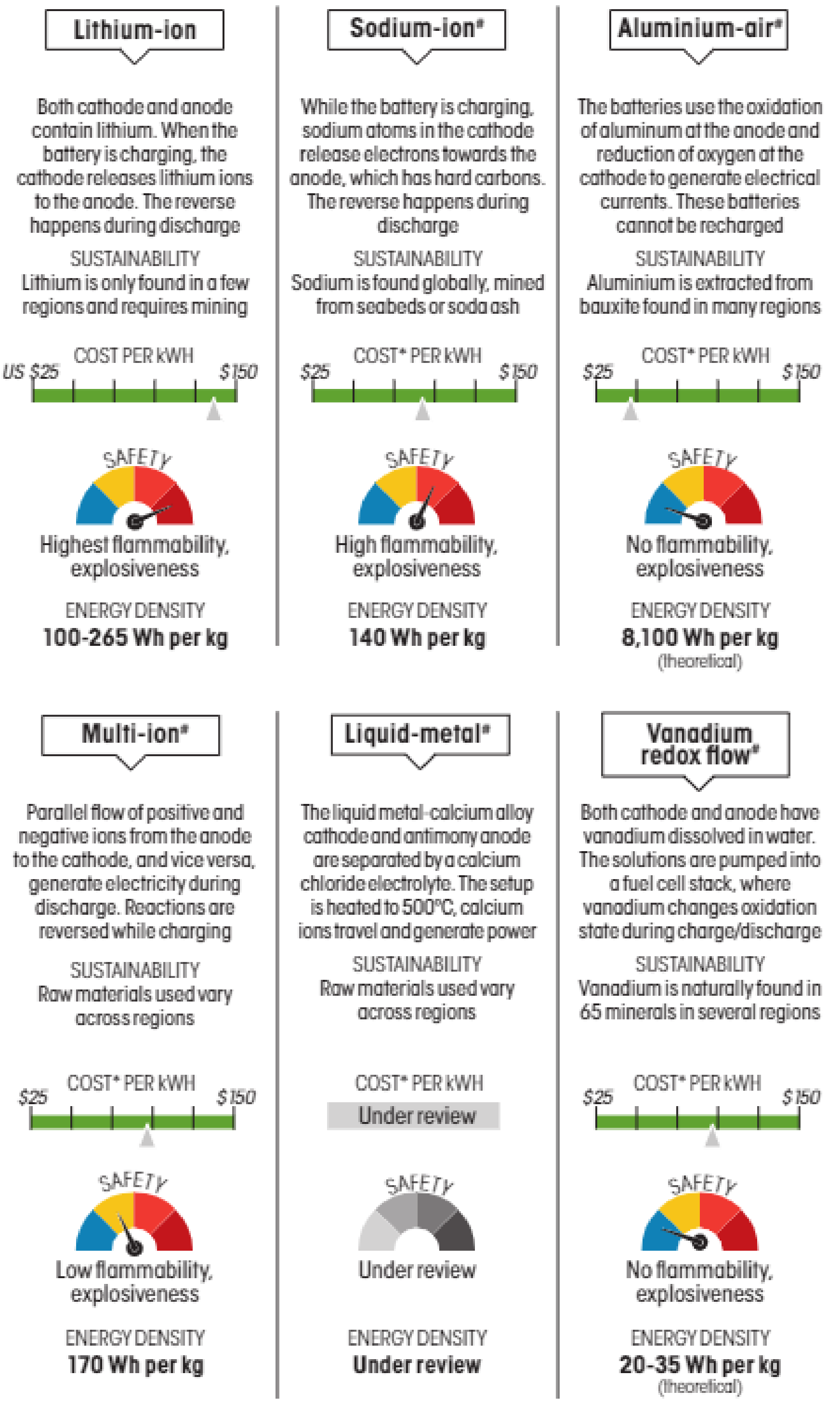
Dhanya Puthusseri, a postdoctoral researcher at Princeton University, US, though is not convinced. "Like lithium, sodium-ion batteries also use organic electrolytes that are flammable," she explains. She adds it is possible to make the batteries safe by modifying their chemistry.

Sodium also falls short in terms of energy density, thus making it difficult to make small batteries for use in electric vehicles. According to Faradion, its sodium-ion batteries have an energy density of over 140 Wh per kg, while CATL's candidate can achieve up to 160 Wh per kg. However, Kalaiselvi says they may penetrate the consumer electronics market first, and later electric vehicles once scientists improve their chemistry.

Nevertheless, Indian players are exploring other options for small batteries. In March 2021, state-owned Indian Oil entered

## POWER PLAY

The myriad energy applications may require different battery types, resulting in a technology mix in the market



**Lithium-ion**

Both cathode and anode contain lithium. When the battery is charging, the cathode releases lithium ions to the anode. The reverse happens during discharge

SUSTAINABILITY
Lithium is only found in a few regions and requires mining

COST PER KWH
US $25 — $150

SAFETY
Highest flammability, explosiveness

ENERGY DENSITY
**100-265 Wh per kg**

**Sodium-ion#**

While the battery is charging, sodium atoms in the cathode release electrons towards the anode, which has hard carbons. The reverse happens during discharge

SUSTAINABILITY
Sodium is found globally, mined from seabeds or soda ash

COST* PER KWH
$25 — $150

SAFETY
High flammability, explosiveness

ENERGY DENSITY
**140 Wh per kg**

**Aluminium-air#**

The batteries use the oxidation of aluminum at the anode and reduction of oxygen at the cathode to generate electrical currents. These batteries cannot be recharged

SUSTAINABILITY
Aluminium is extracted from bauxite found in many regions

COST* PER KWH
$25 — $150

SAFETY
No flammability, explosiveness

ENERGY DENSITY
**8,100 Wh per kg**
(theoretical)

**Multi-ion#**

Parallel flow of positive and negative ions from the anode to the cathode, and vice versa, generate electricity during discharge. Reactions are reversed while charging

SUSTAINABILITY
Raw materials used vary across regions

COST* PER KWH
$25 — $150

SAFETY
Low flammability, explosiveness

ENERGY DENSITY
**170 Wh per kg**

**Liquid-metal#**

The liquid metal-calcium alloy cathode and antimony anode are separated by a calcium chloride electrolyte. The setup is heated to 500°C, calcium ions travel and generate power

SUSTAINABILITY
Raw materials used vary across regions

COST* PER KWH
Under review

SAFETY
Under review

ENERGY DENSITY
**Under review**

**Vanadium redox flow#**

Both cathode and anode have vanadium dissolved in water. The solutions are pumped into a fuel cell stack, where vanadium changes oxidation state during charge/discharge

SUSTAINABILITY
Vanadium is naturally found in 65 minerals in several regions

COST* PER KWH
$25 — $150

SAFETY
No flammability, explosiveness

ENERGY DENSITY
**20-35 Wh per kg**
(theoretical)

Note: *Costs estimated in relation to current costs of lithium-ion batteries #information on sodium-ion batteries from Faradion, aluminium-air from Phinergy, multi-ion from Gegadyne Energy, liquid-metal from Ambri and vanadium redox flow from Invinity
Sources: Company websites, scientific studies, expert comments

# Moving towards Clean Environment under the dynamic leadership of Hon'ble Chief Minister Sri Y.S. Jagan Mohan Reddy

## ACHIEVEMENTS & INITIATIVES

**APEMC:** AP Environment Management Corporation, the first of its kind in the country formed for providing effective mechanism for collection, transportation, storage, treatment, processing, delivery and disposal of industrial waste and other wastes.

**High Density Plantation (HDP):** Promoting concept of HDP by Miyawaki method among more than 150 industries within the state to control fugitive emissions and to act as carbon sinks in the form of Miniature forests.

**Grievance Portal:** Launched the Environment Public Grievance Redressal Portal for anyone to register their environment related grievances / suggestions at EPGRS portal (https://pcb.ap.gov.in)

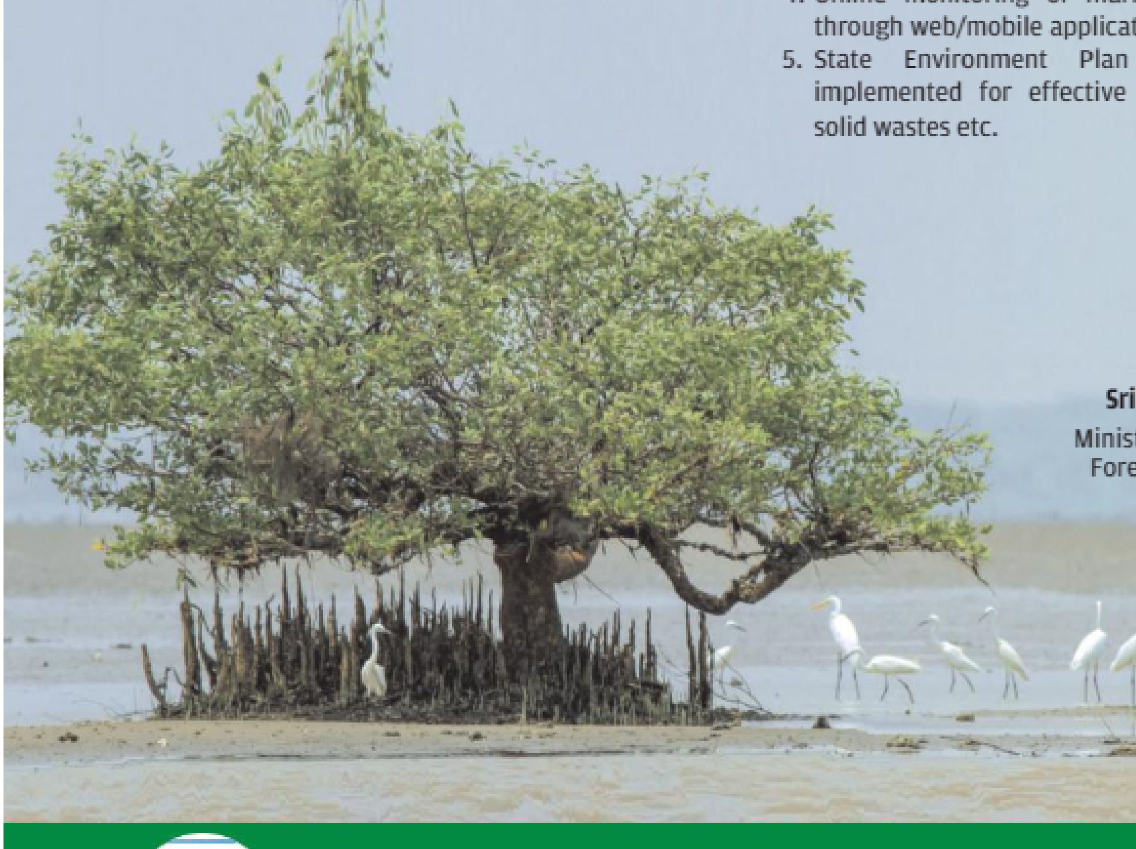
**RTPMS:** Implementing Real-Time Pollution Monitoring System to capture, store and disseminate real time monitoring data of Ambient air, Stack and effluent. 'PARYAVARAN' mobile application is available for public disclosing AQI in 20 cities / towns.

### INITIATIVES

1. Online Consent Management & Monitoring System (OCMMS)
2. Randomized inspections based on computer allocation.
3. Action plans prepared and being implemented for improvement of Air Quality, Water Quality and control of noise pollution through stakeholder departments.
4. Online monitoring of marine industrial discharges through web/mobile application.
5. State Environment Plan prepared and being implemented for effective management of various solid wastes etc.

**Sri Balineni Srinivasa Reddy**

Minister of Energy, Environment,
Forests, Science & Technology



**ANDHRA PRADESH POLLUTION CONTROL BOARD**

Kasturibaipet, Vijayawada - 520010, Phone: 0866-2463200, website:pcb.ap.gov.in into a joint venture with Israeli company Phinergy to develop aluminium-air batteries. These are an attractive option for electric vehicles because their energy density surpasses that of lithium. Moreover, India ranks fifth in the global bauxite (the ore from which aluminium is mined) reserve base. Puthusseri points out that these batteries cannot be recharged, so users will have to constantly change batteries.

Mumbai-based startup Gegadyne Energy Labs Pvt Ltd is developing multi-ion batteries that can charge mobile phones, laptops and electric vehicles in 15 minutes. Jubin Varghese, chief executive and co-founder of the company, claims the technology has an energy density of 170 Wh per kg. It is 20-30 per cent cheaper than lithium-ion batteries and will be launched within the next 12-24 months, he says.

While Gegadyne's exact chemistry is not known yet, a 2019 study by Chinese researchers in the journal *Energy Storage Materials* suggests that this technology deploys negative ions such as hexafluorophosphate or tetrachloroaluminate, along with multiple positive ions like sodium, potassium and magnesium. Scientists are currently using different chemistries to design more efficient batteries, say the researchers from the Shenzhen Institute of Advanced Technology under the Chinese Academy of Sciences.

Reliance has also invested $50 million in US-based startup Ambri, which has a patent for a liquid metal battery technology. The company website says its battery contains a liquid calcium-alloy anode, a molten salt electrolyte and a cathode comprised of solid antimony particles. When heated to 500°C, the system produces energy, says the company. However, its density and applications are still under review.

Overall, it is unlikely that just one battery type will monopolise the market, says CEEW's Tyagi. "Every application would need a different type of battery, so there could be a technology mix."

## FIT FOR THE GRID

While battery makers have until now focused on technology to power electric vehicles and electronics, experts are pointing to a need to explore their potential for stationary energy storage—batteries can support the electricity grid by storing excess energy generated by solar and wind sources and releasing it on demand. These batteries can use technologies with lower energy density, as they do not have space constraints.

**WHILE BATTERY TECHNOLOGY HAS SO FAR FOCUSED ON MOBILITY AND CONSUMER ELECTRONICS, THERE IS A NEED TO EXPLORE ITS POTENTIAL TO SUPPORT THE STATIONARY GRID BY STORING SOLAR AND WIND ENERGY AND RELEASING IT ON DEMAND**

These batteries can play a crucial role in helping India achieve its target of having 450 gigawatts of renewable energy from solar and wind by 2030. For instance, "when we look at it in terms of replacing everyday electricity from the grid in the five southern states of the country with renewable energy, we will need some 300 gigawatt-hours of storage," says Sreenivas Jayanti, associate professor at the Indian Institute of Technology, Madras.

He adds that an element like vanadium will help here. Battery makers claim vanadium outperforms lithium in safety and scalability and can last for 15-20 years as against the latter's lifespan of four-five years. It is naturally present in 65 different minerals and makes up over 20 megawatt hours of installed storage capacity globally. Vanadium redox flow batteries, a type of electrochemical cell where energy is generated through the pumping of dissolved vanadium on separate sides of a membrane, are already in use globally by players such as Invinity Energy Systems that is based in the UK and US. "In India, battery scientists have largely focused on electric mobility, which is why vanadium has not made an entry yet," says Jayanti.

Any new battery technology for storage, when introduced, will need to be evaluated in the real world. Data on how they interact with the grid and respond to a signal change such as discharge or charge is missing, Tyagi points out. Moreover, a prototype that works in the laboratory might fail on the ground, Puthusseri adds. Moving forward, India should strengthen its battery ecosystem by forging ties between scientists and industry and raising funding, Tyagi and Kumar assert.

Focus should also be on building a robust recycling system. According to Kalaiselvi, the country can fulfil one-third of its future battery needs by recycling discarded lithium-based gadgets. Other technologies should also be studied on this aspect. DTE

@rohinikrish9

SCHOOL OF WATER AND WASTE
AAETI

### ADVANCED RESIDENTIAL TRAINING PROGRAMME ON

# URBAN WATERBODIES REJUVENATION AND MANAGEMENT

Dates: **February 22-24, 2022**
Course Duration: **Three days (24 hours)**
Venue: **Anil Agarwal Environment Training Institute** (AAETI), Nimli, Rajasthan
Course Type: **Residential**

CSE - School of Water and Waste (SW&W) is organising a three-day advanced residential training programme on urban waterbodies rejuvenation and management. The training will focus on key components of urban waterbodies management including catchment area management, buffer area planning and design, pollution abatement in water-bodies and effective stakeholder engagement; as well as existing and upcoming institutional and regulatory framework.

## AIM

Build a cohort of practitioners and managers (both government and private) who will plan, design and implement urban waterbodies rejuvenation interventions.

## TRAINING HIGHLIGHTS

- Understand key aspects of waterbodies rejuvenation: catchment area management, buffer area design, pollution abatement in waterbodies: to understand key challenges and potential of urban waterbody rejuvenation.
- Step by step guide to prepare urban waterbody management plan including stakeholder engagement, community participation, O&M strategies and socio-economic and other benefits.
- Existing and upcoming institutional regulatory framework (policies, plan and programmes) for WSUDP
- Field visit to interact with real implementers and beneficiaries

## TRAINING DESIGN

The training will follow a mix method approach involving lectures, in-class exercises, interactive discussions and audio-video training support to understand urban waterbodies rejuvenation in the context of a water sensitive city. The participants will get the opportunity to prepare an urban waterbody management plan 'Do It Yourself' – group exercise.

**Participants will be awarded a Certificate of Completion upon successful completion of the training programme**

## TARGET AUDIENCE

Architects, planners, engineers and other water and sanitation professionals working with consultancies, design firms, non-profits, government departments & agencies, research institutions and academic centres.

### Alumni of the online courses

- Urban Lake Management
- Water Sensitive Urban Design and Planning
- Green Infrastructure - Effective measures to manage urban flooding and water supply
- Water Woes - Reality of Urban Water Management
- GIS and Remote Sensing for Designing & Implementing Green Infrastructure
- Basics of GIS and Remote Sensing for Water and Sanitation

## TRAINING FEES

**INR 19,800** (for single occupancy accommodation)
Includes tuition fee, training material, external expert lectures and sessions, boarding and lodging, transport from New Delhi to AAETI and back

### Limited full and part fellowships available

**Full Fellowship** includes travel, boarding & lodging costs and training kit & fees costs. Single occupancy accommodation and group pick-up & drop for local travel from pre-defined locations in Delhi.

**Part Fellowship** doesn't include to & fro Delhi travel (from your respective location) costs but covers full boarding & lodging costs and training kit & fees. Single occupancy accommodation and group pick-up & drop for local travel from pre-defined locations in Delhi.

**Female participants are encouraged to apply and given preference in full / part fellowships.**

Note: Only shortlisted candidates will be informed.

## TRAINING COORDINATOR

Dhruv Pasricha, Programme Officer, Urban Water Programme
Mobile: +91-8527447891
Email: dhruv.pasricha@cseindia.org

## TRAINING DIRECTOR

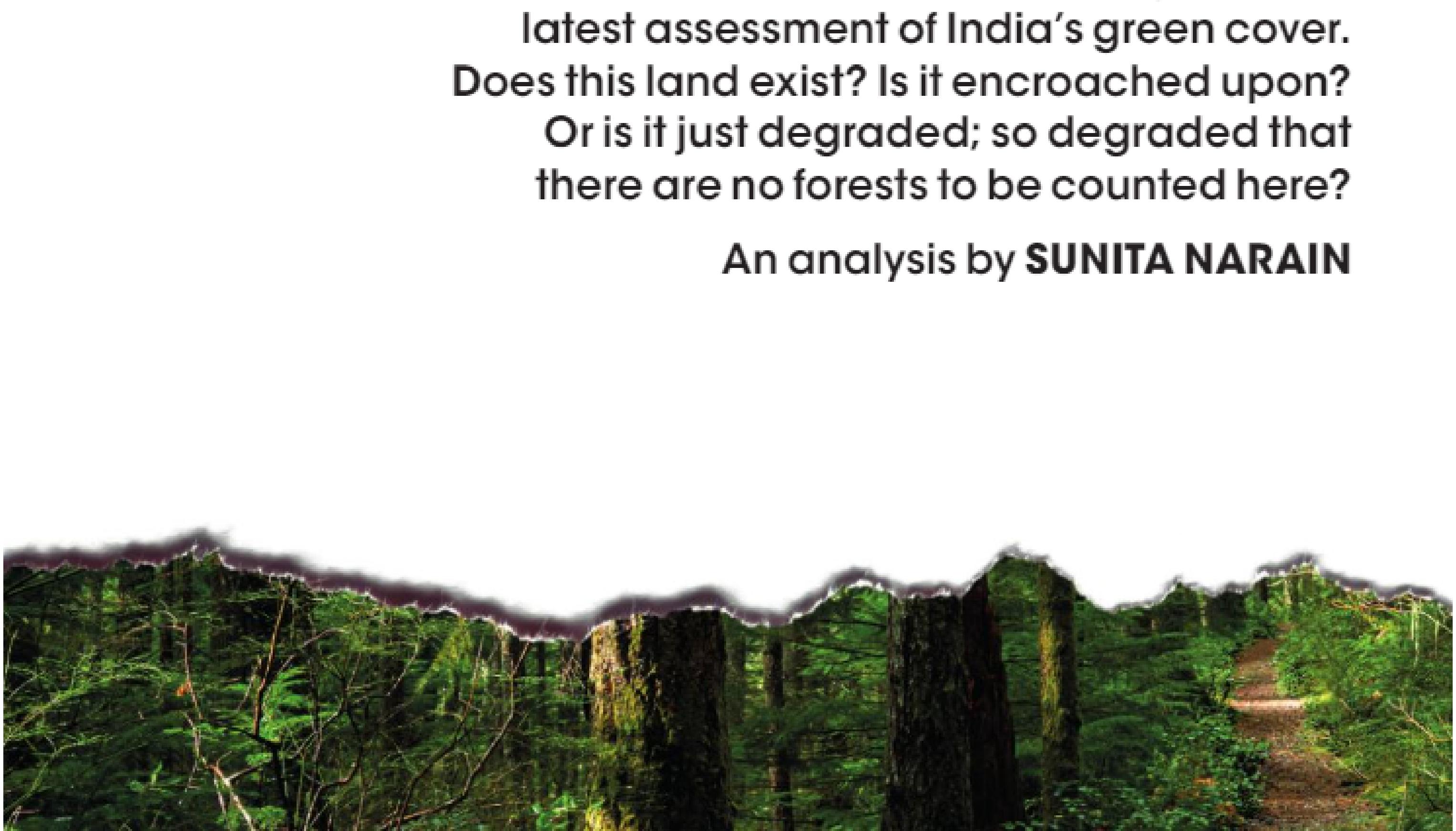
Dr Suresh Kumar Rohilla, Senior Director, CSE
Academic Director, School of Water & Waste, AAETI
Email: srohilla@cseindia.org

**CLICK HERE TO REGISTER**

# 25.87 MILLION HECTARES

That is the size of forest missing from the latest assessment of India's green cover. Does this land exist? Is it encroached upon? Or is it just degraded; so degraded that there are no forests to be counted here?

An analysis by **SUNITA NARAIN**



Some four decades ago, in the mid-1980s, the National Remote Sensing Agency, Hyderabad, prepared a report on India's forest cover using satellite imagery. The report compared the forest cover between 1972-75 and 1980-82, and found that the country had lost 1.3 million hectares (ha) of forests every year in this seven-year period. This estimate was way higher than what was projected each year by the forest department, and shocked the country. For the first time, there was a visual overview of the state of forest cover from the sky, which had shown a decline. It spurred action and kick-started conservation and afforestation in the country. Soon, the Forest Survey of India (FSI), Dehradun, was tasked with producing an assessment of the country's forest wealth every two years.

Such a report is critical because it reflects the health of forests, which is crucial for livelihood, economic growth and carbon sequestration—in that order—for a country like India. The bulk of the country's forests are the habitat of its poorest people.

Since 1988, when FSI produced the first "State of Forest Report 1987", the capability of satellites and of interpretation of forests has improved substantially, but the same is not the case with the state of the country's forest cover. Let me explain this.

"India State of Forest Report 2021" (ISFR 2021), released on January 13, 2022, shows a minimal increase of 0.16 million ha (0.2 per cent) in the forest cover between 2019 and 2021 (see 'Negligible increase' on *p*28). The quality of forests also seems to have been stable. There is, in fact, some increase in the "very dense" forest category (with canopy cover of over 70 per cent) and in the "open" forest category (canopy cover 10-40 per cent), and almost an equal decrease in the

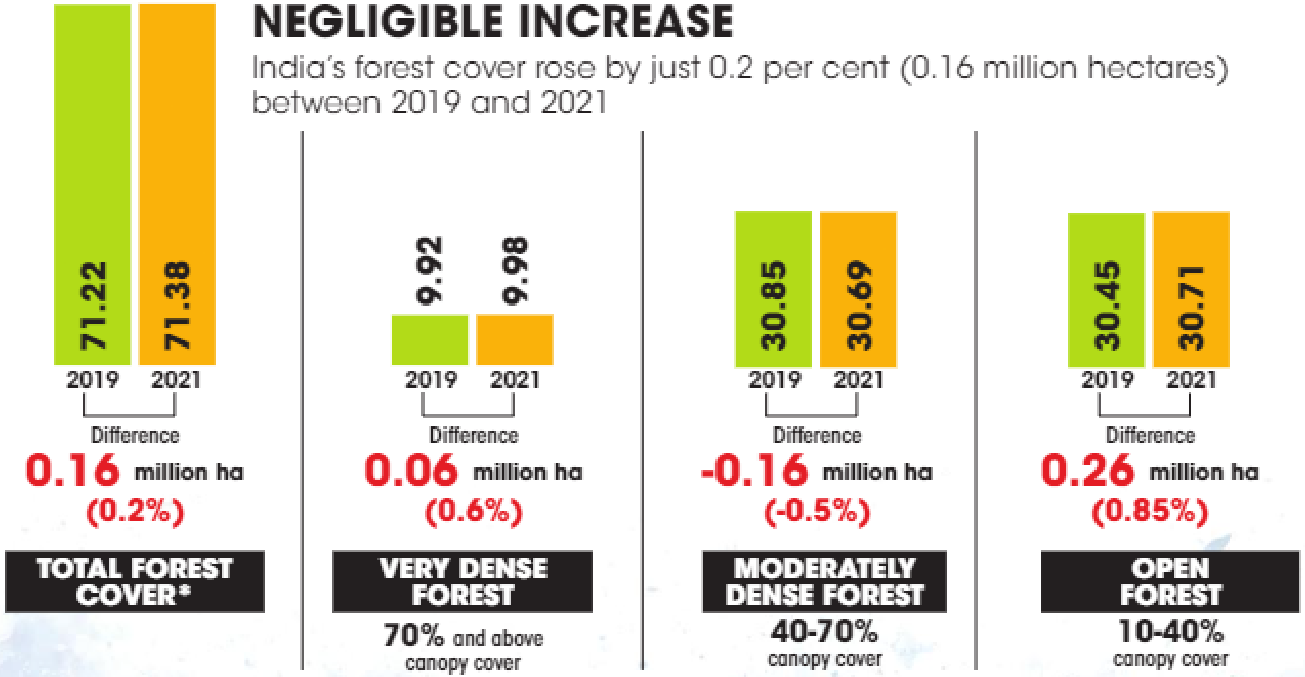
moderately dense forest category (canopy cover 40-70 per cent). You could argue that this does not merit analysis—criticism or boast. But the fact is that (i) more forests are now growing outside than inside the recorded forest area (forest land under control of the state government's forest department); (ii) most forests are now concentrated in areas classified as "tribal" by ISFR 2021; (iii) reported forest area is increasing by counting trees outside the forest; and (iv) even the forest stock is growing outside the recorded forest area. Let's analyse these one by one.

## FORESTS GROWING 'OUTSIDE' AND IN 'OPEN'

An assessment of forest cover outside the recorded forest area was first done as part of ISFR 2015. In other words, this was the first report to assess forests outside of the land under control of the state government's forest department. Initially, in absence of digitised

## NEGLIGIBLE INCREASE

India's forest cover rose by just 0.2 per cent (0.16 million hectares) between 2019 and 2021



* Forest cover is all land of more than 1 ha with over 10 per cent tree canopy density; Source: India State of Forest Report 2021

## OUTWARD GROWTH

Increase in forest cover inside recorded forest area between 2019 and 2021 has been insignificant, while the growth outside is 0.76%, driven primarily by open forests

| RECORDED FOREST AREA (RFA*) | FOREST COVER# INSIDE RFA (in million ha) | | | FOREST COVER OUTSIDE RFA (in million ha) | | |
|---|---|---|---|---|---|---|
| | 2019 | 2021 | % change | 2019 | 2021 | % change |
| **Very dense forest** (70% and above canopy cover) | 8.73 | 8.77 | **+0.48** | 1.19 | 1.20 | **+1.4** |
| **Moderately dense forest** (40-70% canopy cover) | 24.07 | 23.96 | **-0.46** | 6.78 | 6.73 | **-0.71** |
| **Open forest** (10-40% canopy cover) | 18.86 | 18.93 | **+0.38** | 11.58 | 11.78 | **+1.62** |
| **Total forests** | **51.66** | **51.66** | **+0.00** | **19.55** | **19.72** | **+0.76** |

*RFA: All areas recorded as 'forests' in government records, and consists of Reserved Forests and Protected Forests; #Forest cover: Any land more than 1 ha with over 10% tree canopy density; Source: India State of Forest Report 2021; Note: Numbers may not sum to the totals indicated due to rounding off

boundaries of state forests, this was done by taking the topographical sheets of Survey of India, which include areas called "green-wash"—shown in green—and correspond "by and large to the recorded forest area of the country". In this way, the assessment could differentiate between forests within the recorded area and outside. By the time ISFR 2021 came out, 24 forest departments had provided digitised boundaries of the forest areas in their records, which has further improved this assessment.

ISFR 2021 shows that close to 28 per cent of the forest cover is outside the recorded forest area. About 12 per cent of the very dense category of forests is also outside the recorded areas. The report also shows that the increase in forest cover between 2019 and 2021 has happened primarily because of the growth outside the recorded area. While the forest cover within recorded forests area has witnessed negligible increase, the growth outside has been 0.76 per cent (see 'Outward growth'). This growth is primarily due to the increase in the open forest category. As of 2021, as much as 11.78 million ha of forest cover—16.5 per cent of the total forest cover in the country—is in the open forest category outside recorded area.

The lopsided growth is because of a controversial definition of forest cover. According to FSI, any hectare of land with tree canopy density of 10 per cent or more is defined as forests. Roughly 40 per cent of the open forests are in the outside recorded areas and in all probability, this is where the tea, coffee or other private plantations would be counted as part of forest cover.

### STABLE FORESTS, BUT WHERE?

In 2021, India's total forest cover added up to 71.38 million ha, which is 22 per cent of the country's geographical area. In terms of categories, the very dense forest (canopy cover of 70 per cent or more) constitutes roughly 10 million ha (about 3 per cent of the country's land), while moderately dense forest and open forest are around 30 mil-

**India State of Forest Report 2021 shows that close to 28 per cent of forest cover is outside the recorded forest area; 12 per cent of the very dense category of forests is also outside the recorded areas**

## LATEST NUMBERS

Some 73% very dense forests located in tribal districts

| | 2021 Forest cover* (million ha) | % of total forest cover inside and outside RFA | % of India's geographic area | % of category found in tribal areas of total |
|---|---|---|---|---|
| **VERY DENSE** 70% and above canopy cover | 9.98 | 14% | 3% | 73% |
| **MODERATELY DENSE FOREST** 40-70% canopy cover | 30.69 | 43% | 9% | 60% |
| **OPEN FOREST** 10-40% canopy cover | 30.71 | 43% | 9% | 54% |
| **TOTAL FOREST COVER INSIDE AND OUTSIDE RECORDED FOREST AREA (RFA)** | 71.38 | | 22% | 59% |

*Forest cover is all land of more than 1 ha with over 10% tree canopy density; # RFA: All areas recorded as "forests" in government records, and consists of Reserved Forests and Protected Forests; Source: India State of Forest Report 2021

lion ha (or 9 per cent) each.

What is important to note is that this forest wealth—about 60 per cent of total forest cover and 73 per cent of the very dense forests—is concentrated in districts classified as "tribal" by ISFR 2021. These districts are listed under Schedule V of the Constitution as habitats of Scheduled Tribes. These 218 districts, covering states of the Northeast and located in parts of central India, highlight the resource curse of the richest lands being the habitat of the poorest. These also indicate the urgent need to link livelihoods of communities with forest protection.

### ADD UP TREES FOR GOOD NEWS

Since ISFR 2003, the biennial surveys also include Trees Outside Forests (TOF) as a category. In this category, tree cover includes patches of trees and isolated trees on areas less than one hectare. So, while "forest cover" is defined as all areas, irrespective of ownership, that are more than 1 ha and have more than 10 per cent tree cover, TOF is the count of trees outside forests, irrespec-

## VOLUME OF TREES

India's forest stock inside and outside recorded forests in 2021

| | | | | | | |
|---|---|---|---|---|---|---|
| **77.53** million hectares (ha) | **4,388.15** million cubic metres | **56.60** cubic metres/ha | **29.32** million ha | **1,779.35** million cubic metres | **61** cubic metres/ha | **6,167.5** million cubic metres |
| Recorded forest area (RFA#) in the country | Volume of growing stock inside RFA | Productivity of forests in RFA in terms of growing stock | Area covered by forest and trees outside RFA | Volume of growing stock outside RFA | Productivity of trees, forest outside RFA in terms of growing stock | Total growing stock of India |

Source: India State of Forest 2021

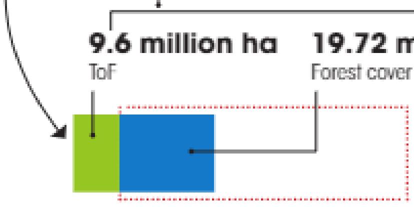
## COUNT AND ADD

Almost a quarter of India is under forest cover if trees outside forest are counted

**328.74 million hectare** total geographic area of the country

Trees outside forests (ToF*) and forest cover# inside and outside recorded forest area (RFA^)

**29.32** million ha (**8.9%** of India's total area or **36%** of its green cover)



**71.38** million ha Total forest cover 2021 (**24.6%** ToF and forest cover inside and outside RFA as % of India's area)

*ToF: patches of trees and isolated trees on areas less than 1 hectare; #Forest cover is all land of more than 1 ha with over 10% tree canopy density; ^RFA: All areas recorded as "forests" in government records, and consists of Reserved Forests and Protected Forests; Source: India State of Forest Report 2021

tive of the size of the patch. These scattered trees are assessed using high resolution data and from field inventory data, and altogether make up close to 10 million ha of land area (see 'Count and add'). In this way, in 2021, forests and trees outside recorded forests added up to become 8.9 per cent of the country's area and almost 36 per cent of the green cover of the country.

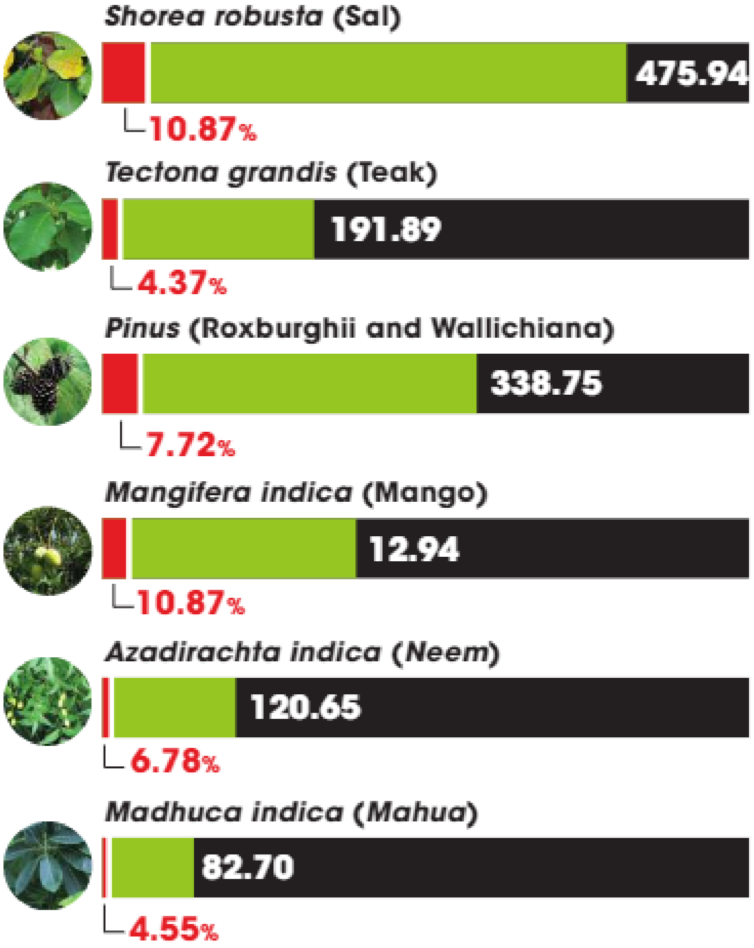
## FOREST STOCK TOO GROWING MORE OUTSIDE THAN INSIDE

The estimation of forest stock is the volume of all living trees in a forested area. It is a critical indicator to measure sustainability—productivity of forests—and also the basis of calculating biomass and carbon stock. ISFR 2021 has calculated the growing stock based on 18,218 sample plots inside forests and 41,630 sample plots outside. It says there is a 4 per cent increase in the growing stock in the country as compared to 2019, of which the bulk is from forests outside the recorded area—of the total increase of 251 cubic metres, 137 cubic metres is from forests outside. What is important is that when compared in terms of growing stock, the land with trees outside forest is more productive (61.35 cubic metres per ha) than that in the recorded forest (56.60 cubic metres per ha). (See 'Volume of trees').

You could still argue that all is well on India's forest front. Really? Read on.

## TOP GROWERS

Stock of main trees in India's forests



Source: India State of Forest Report 2021

# Paper forests

Missing forests and by 25.87 million of hectares

The very bad news is in the unsaid. A total of 25.87 million ha of recorded forest area—forest land under the control of state government's forest department—is not accounted for in the "India State of Forest Report 2021". It just does not exist anywhere in the report. There is no assessment in terms of its coverage. Does this land exist? Is it encroached upon? Or is it just degraded; so degraded that no forest can be counted here? This is India's forest area—land classified as forests; land which is out of bounds for all other purposes than to grow trees on. Should this not be elaborated upon?

This is the real story of the state of our forests. And this is what we must understand and fix. Let me explain.

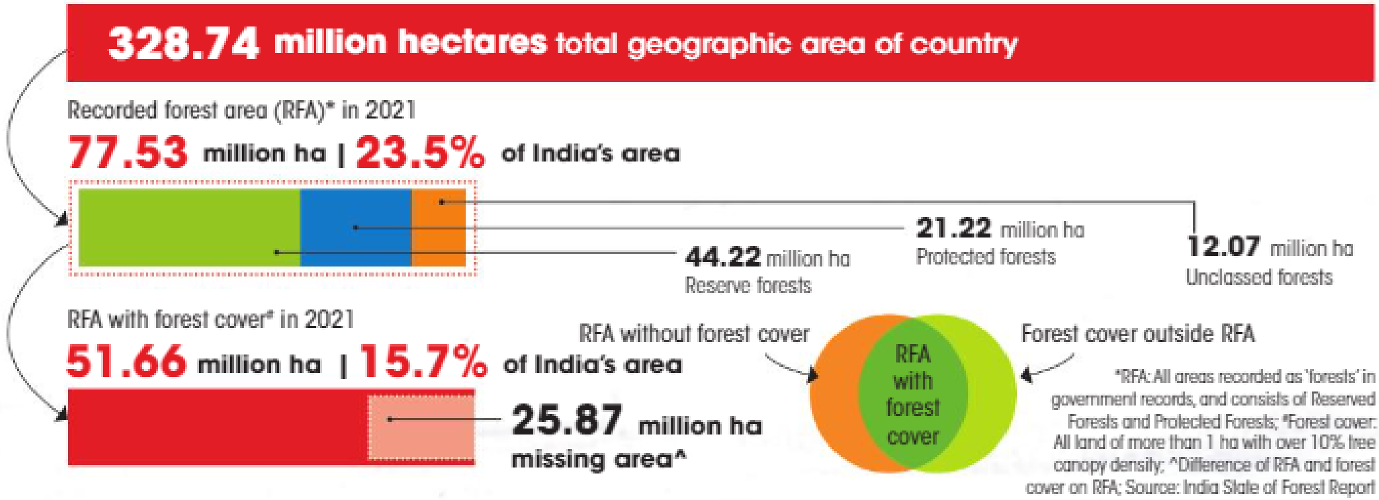
There is a difference between "recorded forest area" and "forest cover". According to the ISFR 2021, the recorded forest area in the country is 77.53 million ha, which is some 23 per cent of the country's geographic area. But the total forest cover is 71.38 million ha. This is a difference of more than 6 million ha—not so significant, one might say. But this is not true. The difference adds up to 25.87 million ha—bigger than the size of Uttar Pradesh. And this is where the story of missing forests begins to unravel.

The recorded forest area is under different legal classes of forests—reserve, protected and unclassed (see 'Overall numbers'). Over the past three decades, this recorded forest area has remained more or less the same.

But forest cover is the actual area where there are forests. This is defined as all land of more than one hectare with over 10 per cent tree canopy density. This could be very dense forests, moderately dense forests and open forests. In addition, there is "scrub", which is forest land with canopy density less than 10 per cent and non-forest land that is not included in any of the above classes. So, you would expect that the total recorded forest area under the forest department—77.53 million ha—would get accounted in these different categories of forest: very

## OVERALL NUMBERS

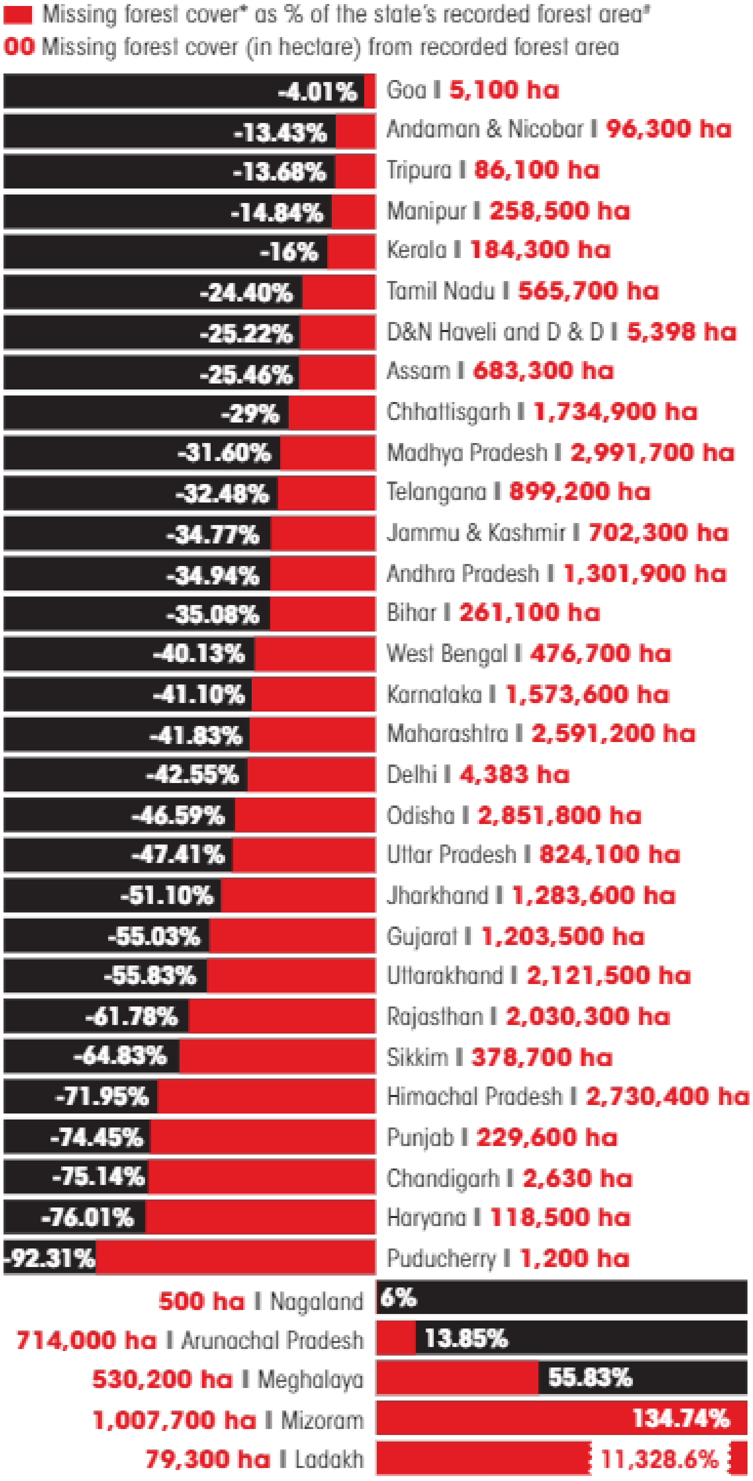
A massive 25.87 million ha forests, or one-third of India's recorded forest area, has not been assessed in the government's latest survey



*RFA: All areas recorded as 'forests' in government records, and consists of Reserved Forests and Protected Forests; #Forest cover: All land of more than 1 ha with over 10% tree canopy density; ^Difference of RFA and forest cover on RFA; Source: India State of Forest Report 2021; Note: Numbers may not sum to the totals indicated due to rounding off

## PRIME LOSERS

State-wise break-up of 25.87 million ha forests gone missing from the government's latest assessment



*Missing forest cover is the difference of recorded forest area (RFA) and the forest cover on RFA; Forest cover: All land of more than 1 ha with over 10% tree canopy density; #RFA: All areas recorded as "forests" in government records, and consists of Reserved Forests and Protected Forests; Source: Down To Earth analysis based on India State of Forest Report 2021

dense, moderately dense, open or scrub. But it is not so.

According to ISFR 2021, only 51.66 million ha of the recorded forest area—the area under the forest department, classified as forests—has forest cover. This means we have the assessment for only 66 per cent of the recorded "forest" area. The rest is unaccounted for. Only in one passing reference, almost as if by mistake, does ISFR 2021 mention that this is "recorded forest without forest cover". This land is not even classified as "scrub".

ISFR 2021 mentions that roughly 4 million ha is classified as scrub, but it is not clear if this is within the recorded forest area or outside. In this way, the assessment completely misses out on explaining what is the state of land under the forest department, which is not included in the forest cover (see 'Overall numbers' on *p*32).

The size of this missing 25.87 million ha of forest is massive. This then is the scale of forest degradation in the country. So, let's get real. Let's get tough on the need for forest regeneration.

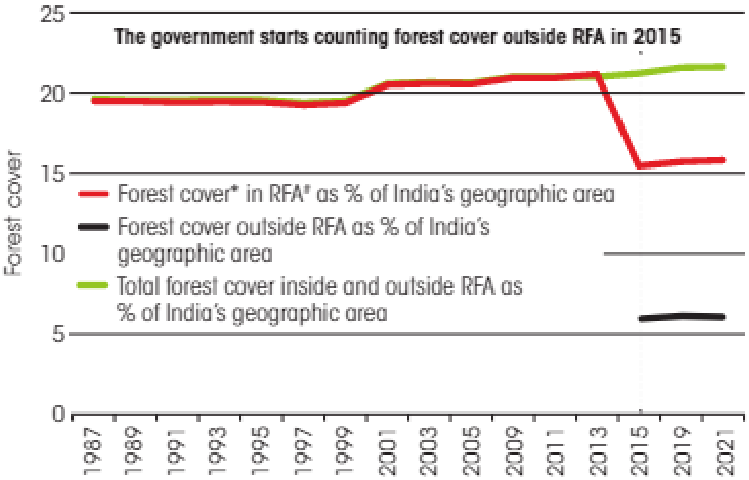
### LAND BUT NO FOREST?

If you dive deeper to understand where these "missing" forests are, it becomes clear that large swathes of land under the forest department in key forested states are in this list. Forested Madhya Pradesh is missing 3 million ha—the difference between recorded forest area and forest cover is close to 32 per cent; in Jharkhand the difference is over 50 per cent. Even if it can be said that this difference is because of uncultivable forest land in the snow covered areas of high Himalayas, it cannot be the case for the bulk of this "missing" and deforested land. More importantly, if this land was "scrub", with little or no vegetation, it should have been accounted for as such.

Also, in some cases, mostly in the northeastern states of Arunachal Pradesh, Mizoram, Meghalaya and Nagaland, ISFR 2021 has higher forest cover in the recorded area, as compared to the area under the state forest department. In these states

## MANUFACTURED EQUILIBRIUM

With forest cover in recorded forest area (RFA) falling, the government starts to count forests outside in 2015



*Forest cover: All land of more than 1 ha with over 10% tree canopy density; #RFA: All areas recorded as 'forests' in government records, and consists of Reserved Forests and Protected Forests; Source: India State of Forest Report 2021

forests are mostly under community control, and so, technically, the forests are outside the area of recorded forests.

### HOW 25.87 MILLION HA GOT LOST

There is no explanation provided in ISFR 2021 on this massive discrepancy—and only in passing does it say that this is recorded forest without forest cover. It only states that "most of the recorded forest area has vegetation cover on it, yet there are blanks and areas with density less than 10 per cent". It does not state that these add up to 25.87 million ha—or one-third of the recorded forest area.

This lack of attention to the state of forests under the forest department is inexplicable. This when, the Forest Survey of India (FSI) has received digital boundaries of recorded forests from 24 states and Union

## THROUGH THE DECADES

India's very dense forests occupy a quarter of what they did 30 years ago, but the country's total forest cover is the same due to growth outside recorded forest area

**00** in million hectare

| | Recorded forest area (RFA*) | Dense forest Over 70% canopy cover | Moderately dense 40-70% canopy cover | Open forest 10-40% canopy cover | Mangrove | Total forest cover# | Forest cover outside RFA | Scrub: less than 10% canopy cover |
|---|---|---|---|---|---|---|---|---|
| 1987 | 75 | 36 | - | 28 | 4 | 64 | - | - |
| 1989 | 75 | 37.8 | - | 26 | 4 | 64 | - | - |
| 1991 | 76.5 | 38.5 | - | 25 | 4 | 64 | - | 6 |
| 1993 | 76.5 | 38.5 | - | 25 | 4 | 64 | - | 6 |
| 1995 | 76.5 | 38.57 | - | 25 | 4.5 | 64 | - | 6 |
| 1997 | 76.5 | 36.73 | - | 26 | 4.8 | 67 | - | 5.7 |
| 1999 | 76.5 | 37.74 | - | 26 | 4.9 | 64 | - | 5 |
| 2001 | 76.5 | 41.68 | - | 26 | - | 68 | - | 4.7 |
| 2003 | 76.5 | 5.3 | 34 | 29 | - | 69 | - | 4 |
| 2005 | 77 | 5.5 | 33 | 29 | - | 68 | - | 3.8 |
| 2009 | 77 | 8.3 | 32 | 29 | - | 69 | - | |
| 2011 | 77 | 8.3 | 32 | 29 | - | 69 | - | 4.2 |
| 2013 | 77 | 8.4 | 32 | 29 | - | 70 | - | 4.1 |
| 2015 | 77 | 8.6 | 24 | 19 | | 51 | 19 | 4.1 |
| 2019 | 77 | 8.7 | 24 | 19 | 5 | 51 | 20 | 4.6 |
| 2021 | 77.5 | 8.8 | 24 | 19 | - | 52 | 20 | 4 |

*RFA: All areas recorded as "forests" in government records, and consists of Reserved Forests and Protected Forests; #Forest cover: All land of more than 1 ha with over 10% tree canopy density; Note: Figures analysed from State of Forest Reports

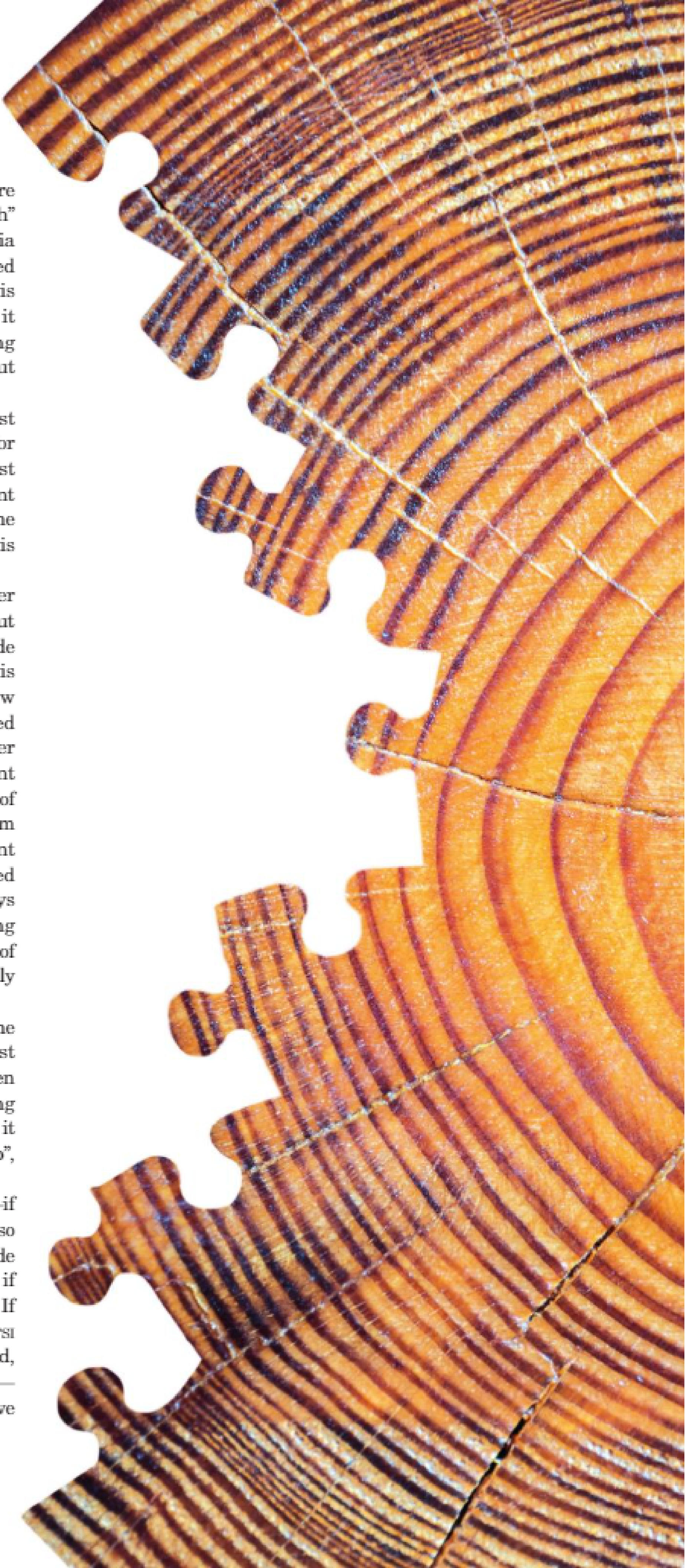
Territories. Where digital boundaries were not available, it has used the "greenwash" (area shown in green in Survey of India topographical sheets) as a proxy for recorded forest areas. This would imply that there is a clear identification of this land and that it would be possible to use remote sensing combined with ground-surveys to map out the current state of its affairs.

An analysis of this from the very first "State of Forest Report in 1987" shows for last three decades, the area in state forest records has remained constant—23 per cent of the land. But what has changed is the analysis of how much of the forest cover is inside and outside this recorded forest.

From 1987 to 2015, the forest cover added up to 20-21 per cent of the land—but it did not specify if this was inside or outside the forest area of the country. In 2015 this changed, when the report added a new category of "forest cover outside recorded forest area". Then the covered area under the recorded forests dropped to 15 per cent of the country's land and the balance area of forest cover was shifted to outside. The sum remained the same—roughly 21.6 per cent of India's area. It could therefore be argued that this "missing" forest was always missing. The satellite and ground-truthing assessment could not identify if this area of forest cover was outside or inside the legally defined areas. It has now been corrected.

But that still does not answer the question. What is the "state" of the forest land which is specified for use for green cover? What is the forest department doing about this one-third of its land? And if it does not even qualify to be called "scrub", then what is its state?

This could be forgotten—written off—if the size of this missing forest was not so massive. It is not possible to brush aside almost 26 million ha. This is land, which if available, should be used for growing trees. If the remote sensing technology, used by FSI can count individual standing trees on land, it certainly can assess the state of this land—recorded as forest on paper. Otherwise, we have paper forests, not real ones.



# Agenda: Forests for real

## We need fifth-generation forest reforms that will secure forests for growth and livelihood

The big picture from the "India State of Forest Report 2021" (ISFR 2021) is this: India's forest cover has increased between the last assessment in 2019 and the latest in 2021 by a minuscule 0.16 million ha—a rise of mere 0.2 per cent. This is not boast-worthy, not even noteworthy.

The increase in forest cover has happened outside recorded forest area, or forest land under the control of state government's forest department. This growth has also happened mainly in forests that are categorised as "open"—forests with canopy cover between 10 and 40 per cent. This shows that forests are growing because people are planting trees on their individual lands, and are planting non-forest species, since there are huge restrictions on planting and felling trees listed in the Indian Forest Act, 1927. These forest lands would thus include plantations of rubber, coconut, eucalyptus and even tea and coffee, which have tree cover of 10 per cent or more in any hectare of land.

The area "outside" the recorded forest is now a substantial portion of the green cover of the country. The forest cover "outside" recorded forest area is 19.72 million ha or roughly 28 per cent of the total forest cover. Now, add to this the tree cover count of 9.6 million ha. It aggregates to 29.32 million ha, which is as much as 36 per cent of the green cover of the country. This land outside recorded forests also contributes to 38 per cent of the forest sinks in the country, according to the Forest Survey of India.

The tree cover (trees outside recorded forest area)—scattered in individual plots—is close to 10 million ha, which is equivalent to the area under the very dense forests in the country. Mango, neem, *mahua* and tamarind are most important trees—species that provide livelihood benefits to their growers. Very dense forests, with canopy cover of over 70 per cent, are now just 14 per cent of the forest cover (or 3 per cent of the country's land area). Of this, 70 per cent and more are found in districts classified as tribal.

Most importantly, vast areas of the country's recorded forest does not find any mention in the report. This area is as much as 25.87 million ha—one-third of the land under the state forest department. The biggest takeaway is, therefore, that forests with forest departments are not growing; and one-third of their land is not even fit for assessment. *Forest cover is growing in spite of the government, not because of it.*

### REINVENT FORESTS FOR FUTURE

ISFR 2021 should make it clear that we need to rework our forest strategies urgently. We need fifth generation forest reforms (5-G forest reform), which will secure forests for growth and livelihood.

Forest management started in India with the colonial British government, which took away community lands and nationalised them. The forests were meant for extraction to aid the colonial government's economic exploitation of the country's resources. The first phase of post-Independent India continued this extractive system. The second phase started in the 1980s, when the Forest Conservation Act and its subsequent amendments were passed, centralising the "diversion" of forest land. The push for this was the growing awareness of the rate of deforestation in mid 1980s.

The third phase came with the mission for afforestation—first it was about growing trees outside forests, in the wastelands that were thought to exist across the country. Soon it became clear that the real wasteland was in the lands controlled by the forest department. It also became clear that survival of the trees required people to keep their livestock out of the afforested wasteland—it required villages to protect the land and to be partners in afforestation. Thus started the Joint Forest Management (JFM), under which local communities would get usufruct rights to forest produce like grass and would guard the land in return so that forests grow. JFM did not succeed because it was a scheme in which state forest departments remained unwilling participants. The forest department showed up only when the trees, protected over the years, were ready for harvest. As part of the agreement, money was to be transferred to the village community. But as has been documented in cases from across the country, the final cheque paid for the forest produce was for such small amounts that it was a joke on the community. It broke trust of people. It destroyed a movement to grow trees and then to fell those so that they could be grown again.

The fourth phase continues till today where forests are a permanent battle ground. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act (FRA), 2006, has corrected a historical injustice, giving communities rights over land they have been living on. According to data from the Union Ministry of Tribal Affairs, till February 2022, some 1.71 million ha of forest land was "settled" as individual rights to people. But there is little attention to the need to afforest these lands and more. This in spite of the fact that we have all the grandstanding announcements of Green India Mission and the funds collected through payments for compensatory afforestation. In reply to a Parliament question in 2020, the Union Ministry of Environment, Forest and Climate Change said that the Compensatory Afforestation Fund Management and Planning Authority, that works under the ministry, has transferred

# KNOW YOUR STOCK

Carbon stock increase too is in trees outside forest

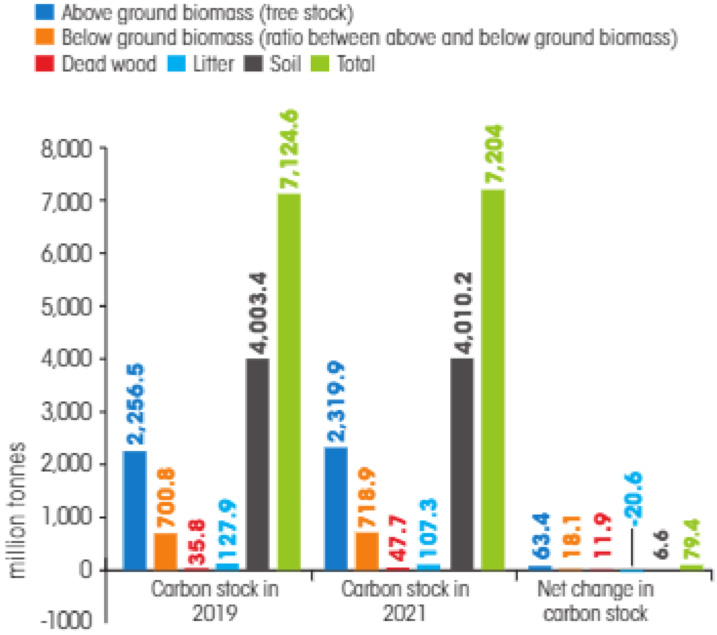
**CARBON STOCK.** This is different from growing stock as it calculates the amount of carbon stored in biomass—in woody growing stock, in vegetation, in leaf litter and soil. According to ISFR 2021, initially Forest Survey of India (FSI) had only calculated the woody growing stock and extrapolated the vegetation to estimate forest carbon. Then for India's Second Communication to the United Nations Framework Convention on Climate Change, it conducted the greenhouse gas inventory from the period 1954 to 2004. It estimated the greenhouse gas flux—the net changes in carbon stock over time. Since the launch of the National Forest Inventory in 2003, FSI has been estimating growing stock and carbon stock in different carbon pools.

The carbon stock is estimated for vegetation—including soil and forest floor—in recorded forest and trees outside forests. According to ISFR 2021 there is a net increase of 79.4 million tonnes in carbon stock between 2019 and 2021. What is interesting is that the biggest decrease in carbon stock has come from leaf litter and increase in above ground biomass. This again would suggest that the carbon stock increase is in trees outside forests.

What is also important is that the bulk of the carbon stock—56 per cent—is in the soil as per this assessment. The report also states Trees Outside Forest (TOF) is 8.94 per cent of the country's geographical area and nearly 38 per cent of the carbon stock.

## GROWING STOCK

India's forest cover has remained largely same



Source: India State of Forest Report 2021 close to ₹50,000 crore to states for planting trees. There is no report card on the trees planted and their survival rate. IFSR 2021 should make it clear that little "forests" have grown on these governmental lands.

So, it is time for reworking and reimaging the forests for the 5-G reforms. This in times when, on the one hand, there is a need for enhanced protection of the remaining forests for ecological security, and on the other, there is a crucial need to build resilience of communities who live in these habitats—all in the times of increased risk because of climate change.

The 5-G forest reforms should be based on the learning from the past—we must shed reticence to plant what will be cut. The fact is that while the first phase of forest management in the country was extractive and exploitative, this 4th phase continues to be based on conservation to the extent that felling trees planted on one's own land has become a crime. Today, India has to import much of its wood products, and according to a recent report by the International Tropical Timber Organization, a Japan-based intergovernmental organisation, this is often sourced from illegally cut forests in Africa and other nations. This clearly does not speak well for a country that has set aside 23 per cent of its land for forests.

So, the future agenda for forests must be:

### AGENDA 1
### PROTECTION OF THE REMAINING VERY DENSE AND ECOLOGICALLY SIGNIFICANT FORESTS IS CRITICAL

We cannot afford to lose even a hectare of this high quality and biodiverse forests. Therefore, forests for highest level of protection should be identified and this data be made available so that clearance is not granted for projects in such areas.

It is equally important to recognise that the bulk of these very rich forests are found in the habitats of the poorest people in the country. This means doing much more to build strategies for ecological payments to the communities that co-exist on these lands. They must benefit from this protection, not be worse off, because these lands are important for conservation.

The cartography of India—the map where the tiger roam, the dense forests exist, where minerals are found, where rivers come from, but also where the poorest, most marginalised live—must change. This can only happen if we make people partners in conservation and not dismiss them as "biotic pressure".

In 2002, the 12th Finance Commission set up an incentive-based grant, as per the area of forests in the state, to reward the states for conserving forests. The 14th Finance Commission made this "grant" unconditional, which means the states are free to use it as they want, but nobody really knows where it comes or goes. It seems the idea of ecosystem payment for conservation, has been lost. This payment needs to be given to communities that live near the protected, high-value forests. This payment is for ecological services rendered because conservation is happening in their backyard and at their cost. It also means that we need to put a real value on these forests, which are today key for biodiversity conservation as well as carbon sequestration.

### AGENDA 2
### PLAN TO CUT AND PLANT AGAIN ON FOREST LAND WITH COMMUNITIES

The reason vast areas under the forest department remain degraded is that they are also habitats of people and their livestock. This is why planting trees needs involvement of communities. FRA has a

**We need fifth generation (5-G) forest reforms, which will secure forests for growth and livelihood. These reforms should be based on learning from the past**

**Trees are like bank accounts. One generation plants it for exigency and another harvests it. Now this has been demonetised or nationalised**

provision for community forest management and it is time the states made it work. But for this to happen, trees will need to be cut and then planted again, and this means making a business of the minor and major forest produce. Felling of trees is not the problem; the problem is our inability to replant and to regrow them. This is what needs to be fixed. It is time we brought back the saw-mills so that wood can be used to replace cement or aluminium or steel in housing and in furniture. We need a wood-based future. This is good for climate change and if we do this in ways that benefit the communities, then it is good for their livelihoods and for building local economies.

## AGENDA 3
## END THE LICENSE-RAJ ON TREES OUTSIDE FORESTS

ISFR 2021 shows that people are planting trees on their lands, but what is not said is that this plantation is happening against all odds. Under the restrictive conditions that operate in India today, it is literally a crime to fell a tree even if you have planted it on your own land. People do not know if they will get permission to harvest it, transport it or sell it. Under the Indian Forest Act 1927, timber or other produce derived from trees outside forests are treated as forest produce. This is not all. State governments have added to this through their own Acts that govern felling and transit of different tree species. Today, it is a task riddled with high transaction costs and harassment. The fact is trees are like bank accounts. One generation plants it for exigency and another harvests it. Now this bank account has been demonetised or nationalised.

ISFR 2021 includes a fascinating assessment of the state of bamboo resources in the country. It estimates that there are 53,336 million bamboo clumps in the country, up from 13,882 million in 2019. The bamboo bearing area is estimated to be 15 million ha—roughly 20 per cent of the forest cover in 2021. But the potential of this resource remains unutilised because of all the restrictions that come with cutting and transporting trees. After much discussions, the India Forest Act, 1927, was amended in 2017 to remove bamboo from the definition of tree to remove restrictions on its felling and transit in non-forest lands, but the progress is slow.

Foresters argue that this protection is needed since it is not possible to distinguish between trees grown inside or outside the forest. But as ISFR 2021 makes it clear, it is trees outside the forest that are today making the country green. It is time to rework the law to make this happen at scale.

India's tryst with forests started with the Chipko movement, when women living in the high Himalayas "hugged" trees to stop the felling by woodcutters. But we misinterpreted the movement. The women stopped the felling, not because they did not want the tree cut, but they wanted the right to decide when the tree would be felled. They knew their survival was intrinsically linked to forests—they needed these lands for fodder and for water conservation (and even for the privacy to defecate, as they told me when I travelled to them in the early 1980s). But we heard half the message—it got truncated by the time it was relayed to the corridors of power in the plains. We heard that trees had to protected at all costs; not that we needed to build a sustainable future that would be based on the utilisation of wood for local economies.

So, it is time we understood that all this is only possible when protecting and growing trees becomes a business that benefits people who live on the forest lands. Otherwise, the "missing" forest land will remain forest on paper only. @sunitanar

# Natural option

Organic and natural farming approaches are not only profitable and sustainable, but also productive

**AMIT KHURANA, MOHAMMAD ABDUL HALIM** AND **ABHAY KUMAR SINGH** NEW DELHI

IT'S HARD to fathom that just 2.7 per cent, or 3.8 million hectares (ha) of the country's net-sown area is under organic and natural farming despite two decades of government efforts to upscale the practices. The Union government passed its first policy on organic farming in 2005, and introduced the flagship Paramparagat Krishi Vikas Yojana (PKVY) in 2015-16. Recently in December 2021, highlighting the ill-effects of chemical-based farming, Prime Minister Narendra Modi also appealed to make natural farming a mass movement in the country. Some of the prime reasons that hinder the shift is a lack of conviction among policy-makers; limited consensus among the scientific community in favour of organic and natural farming; and the tendency to evaluate the non-chemical agricultural practices only on the basis of yield.

The Centre for Science and Environment (CSE), a Delhi-based non-profit, has recently consolidated long-term evidence on holistic benefits of organic and natural farming by analysing the results of 89 scientific studies, conducted across the country over the last decade, and the findings of government's own All India Network Project on Organic Farming (AI-NPOF) going on in 16 states since 2004. CSE researchers analysed four key aspects: crop yield, cost of cultivation, income and livelihood, soil health and environment, and food quality. In the report, "Evidence (2004-20) on Holistic Benefits of Organic and Natural Farming in India", they state that organic and natural farming are not only profitable and

ILLUSTRATION: RITIKA BOHRA / CSE

sustainable but also productive when compared with the chemical-dependent inorganic farming.

## ON YIELD

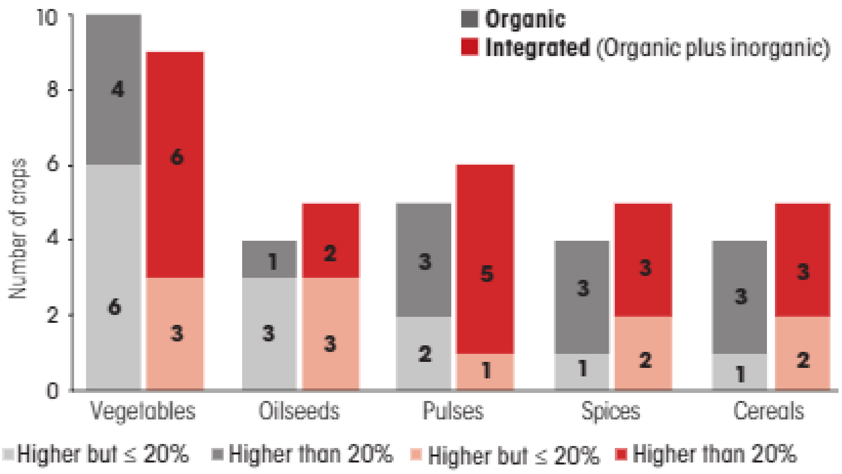
Long-term trends of crop yield from the AI-NPOF experiment show that the organic approach is better than inorganic and is at par with integrated (a mix of organic and inorganic) methods. Of the 504 times yield results were recorded during 2014-19, some 41 per cent of the times yields were highest with the organic approach, followed by 33 per cent with integrated. For vegetables, oilseeds and cereals, the yield with organic approach was better than integrated and inorganic. In pulses and spices, yield with integrated approach was higher than with organic or inorganic approach.

Evidence collated by CSE from other scientific studies further adds to this evidence. These studies have found that in crops such as spinach, baby corn, broccoli, potato, lady's finger, tomato, onion, chilli, pigeon pea, cowpea, black gram, rice, ragi, pearl millet, wheat and banana, yields can be higher with organic and natural farming in comparison to inorganic. In case of natural farming, crops like maize, groundnut, sugarcane, finger millet, soybean, *jowar* (sorghum) and turmeric also show higher yields.

The studies highlight the importance of organic and bio-inputs like farmyard manure, vermicompost, poultry manure, green manure, liquid bio-fertilisers, Jeevamrutha, Beejamritha, Ghanajeevamritha, Panchagavya and fish-protein hydrolysate. Some also find a positive role played by seed soaking with liquid manure, mulching and intercropping in organic farming. After switching to organic practices, crops such as wheat, maize, rice, cluster bean, sesame, cumin and psyllium husk take a few years to produce a comparable or more yield than inorganic, while crops like potato take a year, the findings show.

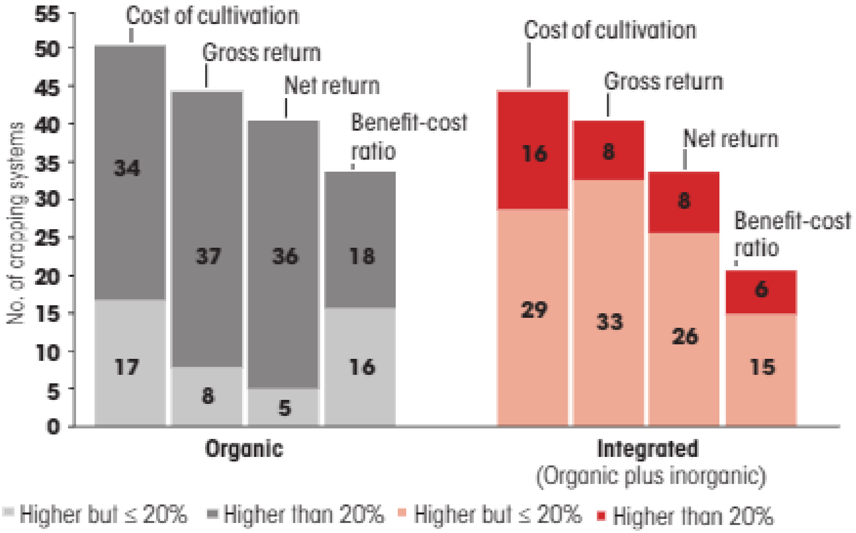
## BETTER YIELD

Comparison of mean yield of organic and integrated approaches with inorganic approach



## CHEAPER INPUTS, HIGHER RETURN

Comparison of mean cost of cultivation, gross return, net return and benefit-cost ratio of organic and integrated approaches with inorganic approach



Source: Evidence (2004-20) on Holistic Benefits of Organic and Natural Farming in India, a report by the Centre for Science and Environment, Delhi

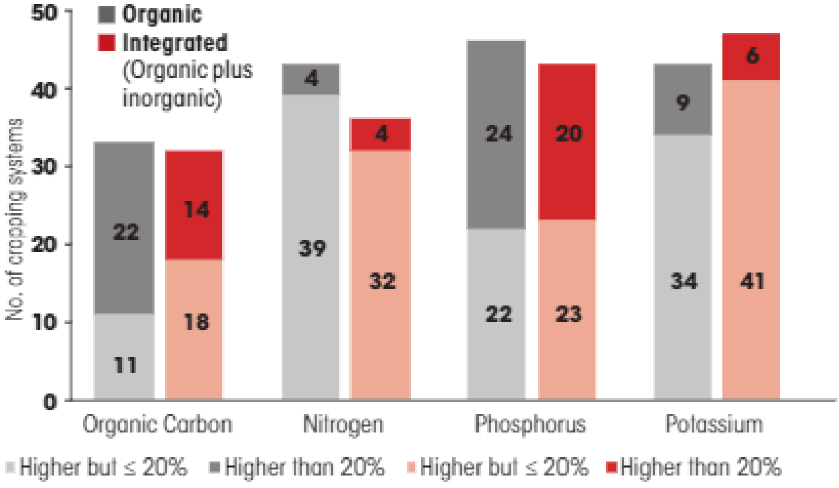
## ON PROFIT

AI-NPOF project shows that the cost of cultivation is higher with the organic approach than integrated. The CSE report explains that the high-cost is because organic and bio-inputs used in AI-NPOF are largely purchased from the market. Whereas, organic inputs cost is less if produced on-farm by farmers.

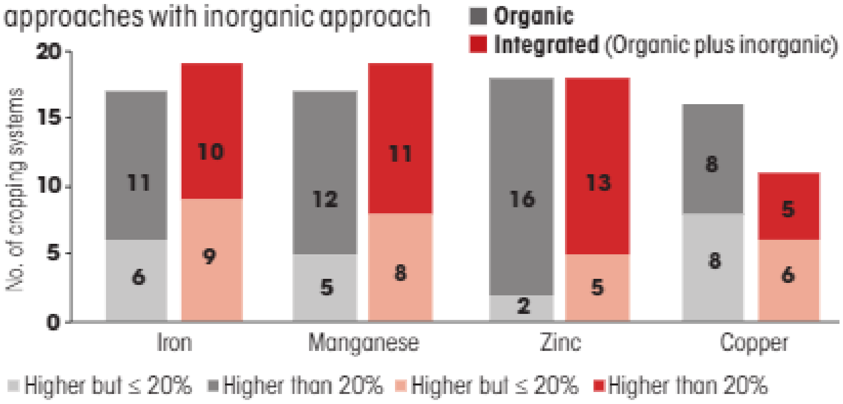
Despite high cost of cultivation at AI-NPOF's farms, net returns are

## SOIL HEALTH

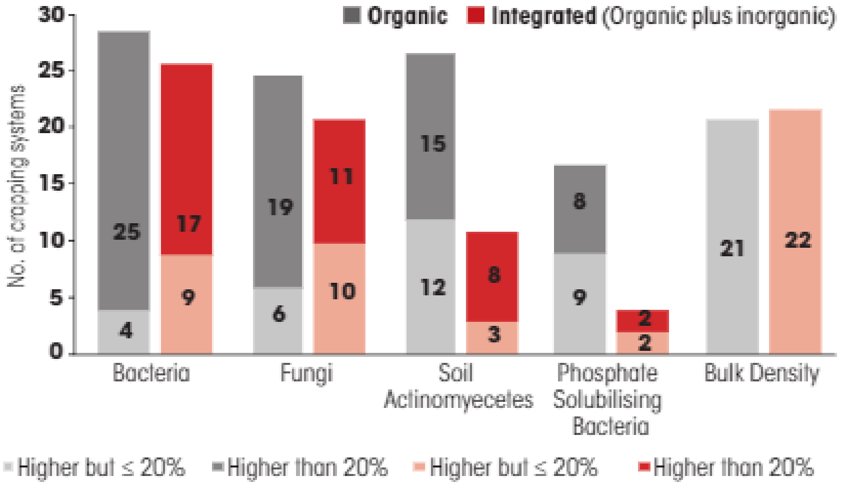
Comparison of soil macronutrients of organic and integrated approaches with inorganic approach



Comparison of soil micronutrients of organic and integrated approaches with inorganic approach



Comparison of soil's mean rhizosphere microbial population and bulk density of organic and integrated approaches with inorganic approach



Source: Evidence (2004-20) on Holistic Benefits of Organic and Natural Farming in India, a report by the Centre for Science and Environment, Delhi

highest in 63 per cent of cropping systems with organic approach. Similarly, in the case of integrated approach, net returns are highest in 11 per cent cropping systems.

Other scientific studies suggest that in the case of natural farming, yields may not always be high for all crops, but the benefit-cost ratio is several times higher than inorganic. Along with minimised cost of production and premium prices for the produce, incomes and profits under natural farming are higher than conventional farming. On an average, even without certification, produce from natural farming fetches twice the income of conventional farming, suggest the studies. Moreover, they, say use of cheaper eco-friendly biofertilisers also makes organic farming a low-cost alternative to chemical methods.

## ON SOIL HEALTH

Healthy soils are the basis for healthy food production. And the AI-NPOF project shows that the organic approach is better at ensuring soil macro- and micro-nutrients, organic carbon and rhizosphere microbiome. While mean organic carbon is highest in 91 per cent cropping systems with organic approach, macronutrients like nitrogen, phosphorus and potassium are higher than inorganic approach in 42 per cent cropping systems. Soil micronutrients like iron, manganese, zinc and copper are also higher (by 76 per cent) with organic approach.

Though the integrated approach led to better results than inorganic in all cases, suggesting that lesser chemicals lead to better results in sustainability parameters, AI-NPOF results show that organic is even better than integrated in all except the cases of potassium, iron, manganese and bulk density.

Organic farming may address both emissions avoidance and carbon sequestration, suggest other scientific studies. Soil health and fertility, macro and micro nutrients, soil organic carbon, soil enzymes, earthworms, soil respiration and microbial biomass increase after adoption of natural farming and Zero Budget Natural Farming (ZBNF). Natural farming also improves overall resilience of crops to adverse climatic conditions and improves energy and water efficiency. It also has the potential to reduce carbon emissions. The studies highlight that ZBNF can help prevent over-extraction of groundwater, enable aquifer recharge and contribute to increasing water table.

## ON FOOD QUALITY

Food quality and nutrition with the organic approach are found to be better than inorganic, and slightly better than integrated. The AI-NPOF study for crops from five food groups (vegetables, oilseeds, pulses, spices and cereals) shows that in 67 per cent cases, results are higher with organic approach and in 64 per cent cases, they are higher with integrated approach. In 12 of the 15 crops, parameters were found highest with organic approach.

Evidence collated from the other scientific studies show that the quality parameters like total carotenoids, total soluble solids, vitamin C, total sugars and lycopene are higher with the organic approach in vegetables and fruits. Organically grown corn, strawberries and Marion berries have significantly higher (around 30 per cent) levels of cancer-fighting antioxidants. In the case of papaya, the quality parameters were higher with organic as compared to recommended dose of fertilisers. Organically grown taro had higher nutrient content. Organic farming also improved the physical attributes of vegetables such as cabbage, tomato and cowpea. Organically grown rice showed higher nutritive values than that grown with chemicals.

## SETTING AGENDA

It is important that the country's larger scientific community, trained in chemical-based agriculture, does not outrightly reject the evidence due to any bias and instead carefully review results of the work done by its scientific colleagues in different parts of the country. They can play a crucial role in spreading awareness, building capacity and influencing policymakers. It is also important that the advantages of organic and natural farming should not be evaluated only on the basis of yield. Benefits of organic farming related to profitability and sustainability strongly outweigh those with inorganic approaches. The existing programmes to support organic and natural farming should therefore be scaled up, expanded and properly funded. Develop a roadmap that sets the long-term agenda for adoption of agro-ecological approaches across different parts of the country in view of its holistic benefits such as nutrition, livelihood of farmers, natural resource conservation, biodiversity, resource efficiency, soil-health, disease resilience and mitigation of climate crisis. This roadmap should also consider mechanisms for incentivising farmers to adopt agro-ecological practices such as payments for ecosystem services, and specifically focus on supporting farmers during the transition to organic and natural farming through technical and financial support.

### NATURAL FARMING IMPROVES OVERALL RESILIENCE OF CROPS TO ADVERSE CLIMATIC CONDITIONS AND IMPROVES ENERGY AND WATER EFFICIENCY

There is an urgent need for a targeted, ambitious and well-funded nationwide programme to drive the change. This includes bringing together ministries and programmes; outlining the centre-state relationship in terms of funds, accountability and coordination; and establishing a vibrant market. Measures to adequately produce and make available quality organic fertilisers and biofertilisers at low cost should be the priority. To help agriculture extension system support the transition on the ground, a capacity among extension officials should be developed.

The organic certification process should be improved to make it farmer-friendly and low cost. Measures should be taken to address concerns about PGS-India (Participatory Guarantee System of India) certification system and its implementation. An alternative certification that is simpler for farmers and trustworthy for consu-mers could be explored for well-connected local markets. The problem could be addressed by introducing a traceability mechanism. States should step up action to promote organic and natural farming. They can be instrumental in helping farmers sell organic and natural produce by developing value chains, procuring produce and getting remunerative prices. DTE

@down2earthindia

# Heritage erased

Kashmir's highly fertile alluvial soil deposits called karewas are being destroyed in the name of development, much to the peril of local people

**RAJA MUZAFFAR BHAT**
SRINAGAR

PHOTOGRAPH: RAJA MUZAFFAR BHAT

THE KASHMIR valley owes much of its fortune to the plateau-like landforms that remain tucked away in the folds of the surrounding mountains, particularly the Pir Panjal range of the Himalayas that borders the valley on the southwest. Known as karewa, these plateaus are 13,000-18,000 m-thick deposits of alluvial soil and sediments like sandstone and mudstone. This makes them ideal for cultivation of saffron, almonds, apples and several other cash crops. Kashmir saffron, which received a Geographical Indication (GI) tag in 2020 for its longer and thicker stigmas, deep-red colour, high aroma and bitter flavour, is grown on these karewas.

The fertility of these patches is believed to be the result of their long history of formation. When formed during the Pleistocene period (2.6 million years to 11,700 years ago), the Pir Panjal range blocked the natural drainage in the region and formed a lake spanning 5,000 sq km (roughly three times the size of Delhi). Over the next few centuries, the water receded, making way for the valley and the formation of the karewas between the mountains. Today, the karewa sediments not only hold fossils and remnants of many human civilisations and habitations, but are also the most fertile spots in the valley.

Despite its agricultural and archaeological importance, karewas are now being excavated to be used in construction. Between 1995 and 2005, massive portions of karewas in Pulwama, Budgam and Baramulla districts were razed to the ground for clay for the 125-km-long Qazigund-Baramulla rail line. The Srinagar airport is built on the Damodar karewa in Budgam. The most recent violation took place on December 6, 2021, when the Baramulla deputy commissioner gave consent for the excavation of karewas around Pattan village and use the clay for the construction of the Srinagar ring road. Two other karewas—in Pulwama and Budgam districts—are also being excavated for the 58-km-long project (see 'Poor call', *p*45).

## PERMANENT LOSS

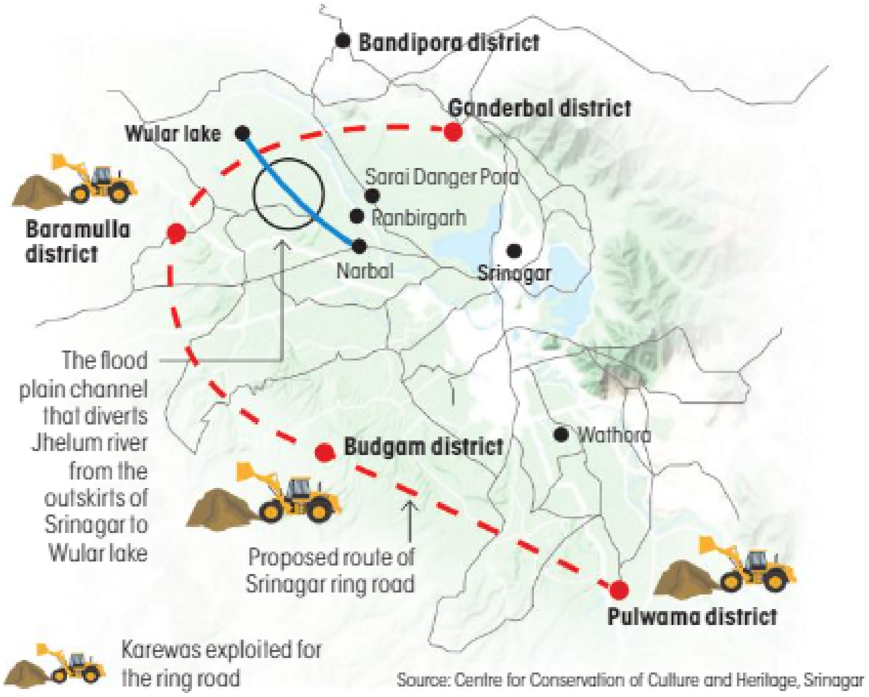
Access to large amounts of soil for development projects is difficult in the valley because of its topography and physiology. At the highest elevation are mountain ranges that are predominantly made up of hard rocks. At the lowest point lies the valley, where the groundwater table is extremely close to the surface (6-9 m). Karewas, as a result, are an easy target due to their soil thickness.

Each karewa runs for several kilometres. While most of the patches are owned by individuals who use them for farming, some belong to the government; these are locally called *kahcharai* and are used for grazing. "We have failed to

Trucks and earth movers excavate soil from the karewa near Pattan village in Baramulla district for the 58-km-long Srinagar ring road

## POOR CALL

Instead of destroying karewas, the government should desilt the Wular lake and its flood channel and use the clay to build Srinagar ring road


Bandipora district
Ganderbal district
Wular lake
Sarai Danger Pora
Ranbirgarh
Baramulla district
Narbal
Srinagar
The flood plain channel that diverts Jhelum river from the outskirts of Srinagar to Wular lake
Budgam district
Wathora
Proposed route of Srinagar ring road
Pulwama district
Karewas exploited for the ring road

Source: Centre for Conservation of Culture and Heritage, Srinagar

understand why the government is using such fertile soil for filling at construction sites. Most households in the district depend on the karewas for their livelihood," says Hamid Rather, a social activist and resident of Pattan, adding that once destroyed, the karewas can never be restored. Rather says dust from the mining of karewas also settles in low-lying areas where people live. Constant movement of diesel-guzzling trucks also causes pollution. "Almost every household has people suffering from respiratory problems," he says.

Residents allege that the government's decision to allow clay mining is illegal. The Jammu and Kashmir Land Revenue Act, 1996, says the topographic shape of a karewa or hill cannot be changed in the valley. But clay mining often razes the highland to the ground and changes the entire topography of the place. The residents allege that the project also violates the Jammu and Kashmir Minor Mineral (Storage, Transportation of Minerals and Prevention of Illegal Mining) Rules, 2016. "The panchayat needs to give consent for minor mineral mining. The order has conveniently bypassed this," says Rather. The December 6, 2021, order, accessed by *Down to Earth*, grants permission to the lifting of clay, a minor mineral, from Pattan after consent from land owners.

## WORTHY ALTERNATIVE

The destruction of the karewas has also led to the enormous accumulation of silt in the Jhelum river, which runs parallel to the Pir Panjal, and its 42-km-long flood spill channel that runs between Padshahi Bagh in the outskirts of Srinagar and Wular lake in north Kashmir through Hokersar wetland reserve. The flood spill channel was created in the 1920s to divert the flood discharge of the Jhelum to Wular lake and thereby protect Srinagar from getting flooded. Ajaz Rasool, environmentalist and hydraulic engineer in Srinagar, explains that siltation occurs due to degradation of catchment areas, which is caused by deforestation and changes in land use, such as clay mining. This has reduced the capacity of the flood spill channel from 481,440 litres of water per second to 169,920 litres per second. As a result, the capital city experienced massive floods in 2014, after a break of almost nine decades. "The government should immediately desilt the Wular lake and its flood plain channel and the muck should be used for developmental projects," says Rasool.

Pattan residents say the government should notify karewas as archaeological sites to promote tourism. "Multiple players across villages have an interest in them. We are trying to get them on board to get karewas legal protection," says Rather. DTE

@down2earthindia

**PATENTLY ABSURD** / LATHA JISHNU

# India trips on its patent waiver proposal

Delhi has not backed its WTO proposal to suspend intellectual property rights on COVID-19 pharma products with robust action

COVID-19 VACCINE
COVID-19 VACCINE
COVID-19 VACCINE

ILLUSTRATION: RITIKA BOHRA/CSE

THERE ARE signs of a stirring at the World Trade Organisation (WTO) to reinforce the battle against the COVID-19 pandemic. Fifteen long months after South Africa and India first proposed that WTO keep in abeyance its TRIPS (Trade-Related Aspects of Intellectual Property Rights) agreement that protects intellectual property rights (IPRS) so medicines, vaccines and diagnostics to fight the SARS-COV-2 virus can be manufactured freely, the body suddenly appears to be in a hurry to arrive at a deal on the contentious plan.

In mid-January, WTO's general council held a meeting in response to India's call to hold a virtual ministerial conference to discuss the waiver. This could have been a reaction to the rapid spread of the Omicron variant of the virus and its subsets across the US, Europe and India. Reports from Brussels speak of secret parleys in Geneva involving the EU, US, India and South Africa at a senior political level, to thrash out a deal on the proposal that has been moribund since October 2020.

The waiver will allow generic manufacturers to override IPRS on medical products, especially vaccines, and make these available sufficiently across geographic locations at a much cheaper cost. This has become an imperative since Big Pharma, in particular Pfizer-BioNTech and Moderna, has been supplying its costly vaccines to rich nations and leaving the populations of poor countries in Africa, Asia and Latin America majorly unprotected. Experts say the new variants of the SARS-COV-2 virus have emerged on account of this.

WTO Director-General Ngozi Okonjo-Iweala appears to have done a turnaround on her initial stand that a TRIPS waiver was not necessary, which became apparent when she suggested a "third way" to bridge the COVID-19 vaccine shortfall based on more licensing agreements (see 'WTO chief brushes aside TRIPS waiver', *Down To Earth*, 1-15 April, 2021). She has now urged member countries to urgently step up efforts reach a compromise agreement. What this entails is cloaked in uncertainty since the plurilateral negotiations are being held away from public view.

India appears to be keen to conclude a pact now, implying that it is ready to make the compromises that the EU and the US have been pressing for. "I think we should really move with all speed to try and conclude this by the end of February," Okonjo-Iweala said in a statement.

This seems a distinct possibility, since WTO is scheduled to hold a technical workshop to support the discussions around COVID-19 vaccine manufacturing and distribution, with representatives of some top vaccine makers scheduled to speak.

India's on-off diplomacy and the lack of a sustained campaign in 2021 have not helped matters, leading to speculation that the Union government was using the waiver proposal as a bargaining chip for trade gains elsewhere. Union Commerce and Industry Minister Piyush Goyal has made periodic statements calling for the waiver, the latest being towards the end of January when he said that a successful resolution of the proposal should be at the core of the global response to the pandemic, as "both a health and moral imperative for all of us".

Yet, suspicions remain about where India's real interests lie. It has turned its back resolutely on issuing compulsory licences (CLs) for life-saving drugs, having assured major Western trade partners that it will not be deploying the option that is one of the flexibilities enshrined in the TRIPS agreement. The country's credentials have also been dented over the past year as it failed to share the know-how for its home-grown vaccine Covaxin, in which public research laboratories played a key role. This has been a signal failure, an omission that has left many wondering, especially in Africa, about India's *bona fides*.

**India's on-off diplomacy and lacklustre campaign for TRIPS waiver have led to speculation about its real intentions on the proposal**

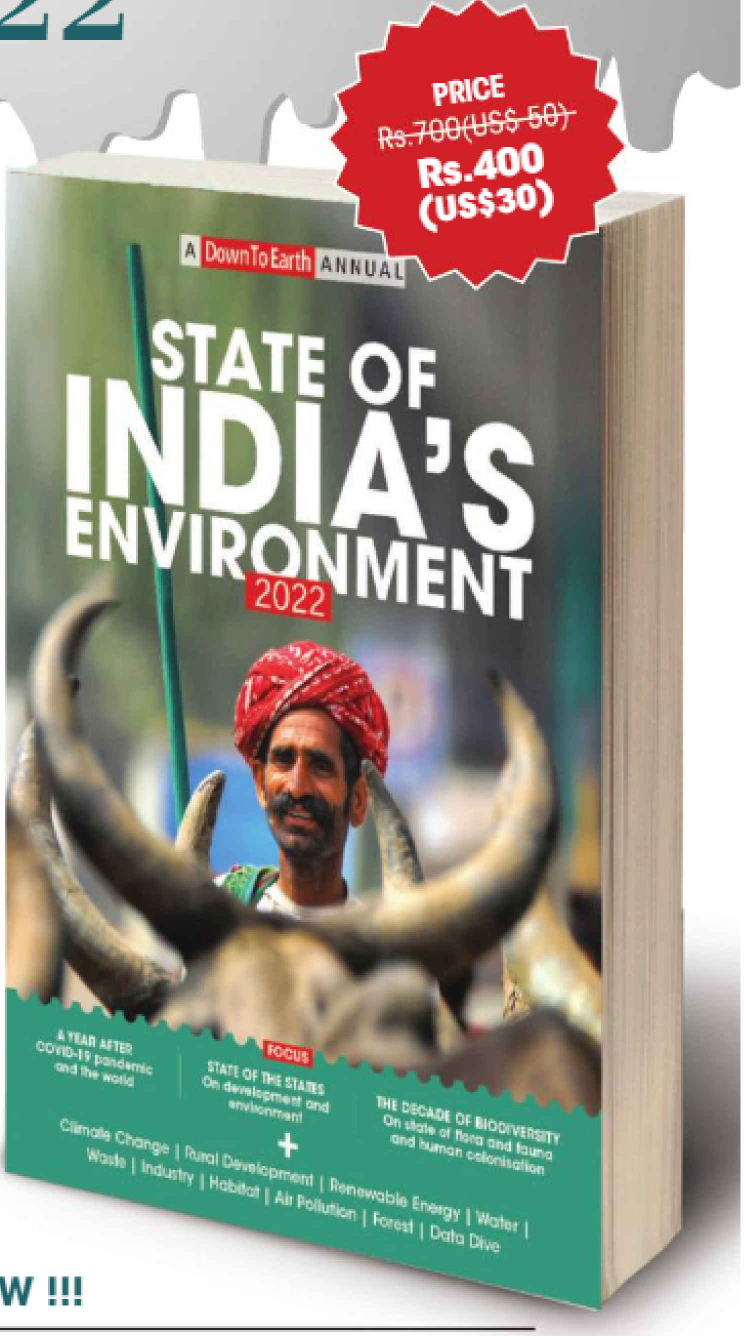
The Modi government's refusal to license the vaccine even to its own public sector manufacturing units raises many questions. Such a move would have allowed the country to increase supplies of much-needed jabs both at home and for supply to low-income countries elsewhere. Its ban on exports of vaccines in the wake of the huge surge in COVID-19 cases during the second wave last year meant a major shortfall in promised supplies to the World Health Organization's global vaccine sharing facility, COVAX. To date, the government has done nothing to share the IP of its own vaccine. This smacks of hypocrisy, reviving long-standing doubts about where India's interests diverge from those of other developing countries on several critical issues.

Clearly, this is not the India of the HIV-AIDS pandemic era, which appeared on the global scene as an intrepid challenger to the monopolistic cartel of multinational drug giants and their predatory pricing of the urgently needed life-saving medicines. Nor is its pharma industry the same one that provided life-saving drugs to Africa and to other parts of the world where the disease was wreaking havoc. As this column has been pointing out, India's generic companies have all opted for the safe and easy route of being contract manufacturers to Big Pharma, content with the risk-free and assured profits bestowed by voluntary licences. Even Yusuf Hamied of Cipla, the daring knight exemplar of generic production, is no longer a challenger. The man who stunned the world by producing life-saving drugs at a fraction of the original cost, today dismisses the idea of CLs. Cipla is a spent warrior of the good fight against exploitative drug majors, having joined the queue for the voluntary licence handouts.

This pattern has been reinforced during the COVID-19 pandemic, by both industry and the government. In addition to the export ban on vaccines that has ensured adequate supplies at home, there is the promise of supplies from foreign vaccines that have been given approval for emergency use. The waiver has become almost unnecessary for India. In the case of therapeutics, too, voluntary licences granted by the originator companies have rendered the waiver very nearly superfluous. That may be the reason why reports from Brussels hint at excluding India—and China—from the waiver that may apply only to certain geographies like Africa. India will have to decide what is in its national interest and what it envisages as its global role. Can it really continue to be the "pharmacy of the world" as it was once described? DTE @ljishnu

A **Down To Earth** ANNUAL

# STATE OF INDIA'S ENVIRONMENT
# 2022


A DownToEarth ANNUAL
STATE OF INDIA'S ENVIRONMENT
2022
A YEAR AFTER COVID-19 pandemic and the world
FOCUS
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THE DECADE OF BIODIVERSITY On state of flora and fauna and human colonisation
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The State of India's Environment 2022 is the **9th annual edition** in this series, and is the country's most authoritative statement on the developments in the environment and related sectors.

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This 9th annual edition also offers a special assessment of the state of development in the States through graphical analysis and data. With contributors ranging from academics, researchers, journalists and policymakers, the report is a must-have for anyone interested in getting the complete picture of all things environmental.

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# Palette

**WHAT'S INSIDE**

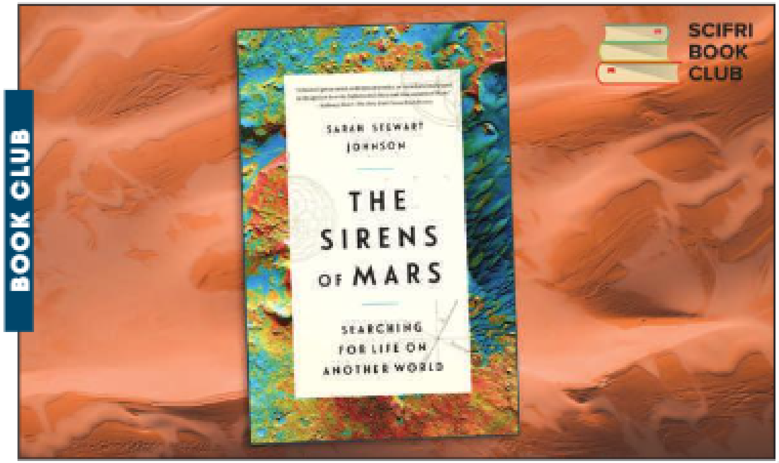
Madhya Pradesh's women groundnut farmers join forces for profit **P50**

An America-focused review of the Anthropocene **P52**

Assam fishers adapt to changes in Brahmaputra waters **P54**

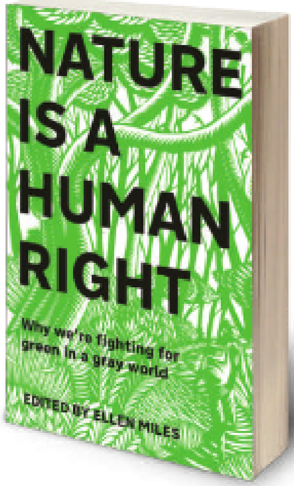
## RECOMMENDATIONS

### BOOK CLUB

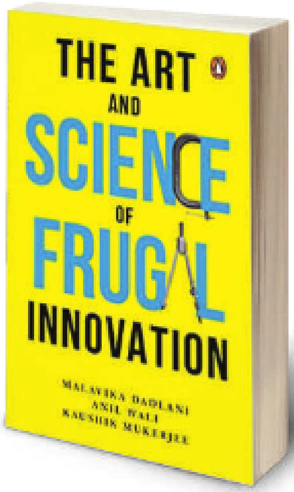

SCIFRI
BOOK
CLUB
SARAH STEWART JOHNSON
THE SIRENS OF MARS
SEARCHING FOR LIFE ON ANOTHER WORLD

Throughout history, humankind has strived to unravel the mysteries of the neighbouring planet from afar, and is slowly gearing up to pay a visit in the near future. Audio broadcast platform *Science Friday* attempts to understand people's fascination with Mars through its latest *Book Club* season starting February 25. In a span of four weeks, the *SciFri Book Club* will read through US-based scientist Sarah Stewart Johnson's 2020 book, *The Sirens of Mars*, and supplement it with other research, podcasts, and public opinions. To sign up, visit *https://www.sciencefriday.com/series/scifri-book-club/*.

### BOOKS


NATURE IS A HUMAN RIGHT
Why we're fighting for green in a gray world
EDITED BY ELLEN MILES

In the name of development, the once green and blue Earth has now turned to all shades of grey with concrete and steel taking over every surface. But don't all of the planet's inhabitants have a right to access natural green spaces as they were intended to be? With this question in mind, UK-based environmental justice activist Ellen Miles began the "Nature is a Human Right" campaign. In this eponymous book, she presents different views on the necessity of green spaces written by researchers, celebrities and activists championing this cause.


THE ART AND SCIENCE OF FRUGAL INNOVATION
MALAVIKA DADLANI
ANIL WALI
KAUSHIK MUKERJEE

Not all technology is sustainable, nor is all innovation expensive. Combining these two facts, scientists and educators Malavika Dadlani, Anil Wali and Kaushik Mukerjee present *The Art and Science of Frugal Innovation*. The book is a comprehensive exploration of how sustainable, scientific and frugal (but not necessarily low-cost) innovations can help humanity wade its way through a world plagued by health and environmental crises and build the foundation for more sustainable development.

# United they stand

Women farmers in 30 villages of Madhya Pradesh join hands to command a higher price for their groundnut produce

**LAKSHMI UNNITHAN**

LAXMI LODHI is happy with the way her life has transformed over the past three years. From a struggling marginal farmer in the tribal village of Mamonikhurd in Madhya Pradesh, she is today a proud member of the region's first women producer collective. Besides working on her groundnut farm, she has the important job of keeping the books of the village collection centre where women groundnut farmers deposit their produce.

The collective was started in 2019 with the support of Delhi-based non-profit SRIJAN (Self-Reliant Initiatives through Joint Action) in three villages of Shivpuri district: Mamonikhurd, Barodi and Salaiy. The district lies in the Bundelkhand region, which is infamous for distress migration, feudalism and gender discrimination. Despite two rivers, the Ken and Betwa, flowing through the region, it faces severe water scarcity that hampers farming, the primary source of livelihood. Groundnut is one of the major cash crops in the region that is usually cultivated by women farmers. The challenge, though, is that these women farmers with their small land holdings are often cheated by intermediaries because of price fluctuation, limited storage facilities and market connectivity. They also suffer from high

PHOTOGRAPH: LAKSHMI UNNITHAN

production costs because of unpredictable rainfall, low soil quality and a lack of scientific agricultural practices. Given these challenges, the women producer collective has emerged as a sustainable solution. In just three years, it has increased the income of women farmers by about 18 per cent.

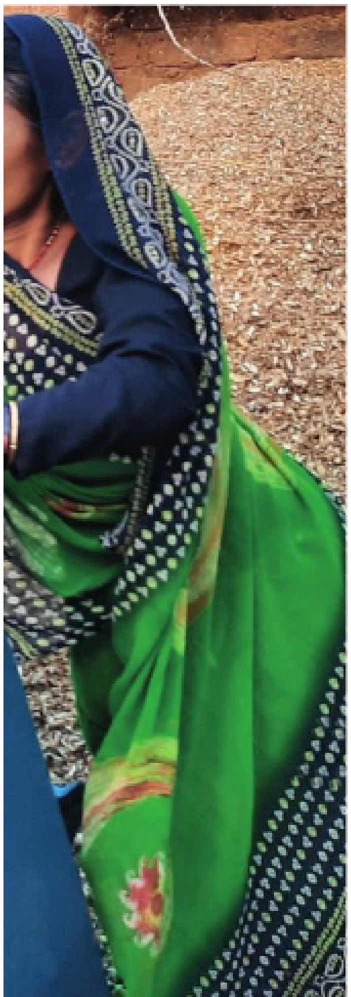
**THE ALL-WOMEN FARMER COLLECTIVE IN 2021 EARNED THEIR FIRST PROFIT THAT WAS DISTRIBUTED AMONG THE MEMBERS AS A BONUS. THEY ARE NOW SETTING UP A COMPANY TO PROCESS AND SELL THEIR PRODUCTS DIRECTLY UNDER THEIR OWN BRAND**

## POWER OF MANY

At the lowest level of the collective are the women groups, which have 22-25 farmers who help each other in harvesting and transporting their produce to the village collection centre, which is also run by them. Currently, there are 70 women groups across 30 villages. The produce from the village centres is then sent to a central processing unit set up at the district level. Every year, one of these women groups is made the nodal group for overseeing the overall operations.

To get the best price, two to three women are nominated by the various groups and trained by SRIJAN to check the quality of the produce, quote prices, and select potential buyers from the main markets. Once they finalise the purchaser and get the money transferred to the collective's bank account, they notify the team of women at the central processing unit, who then procure the desired quantity from the village centres, package and send the order to the purchaser.

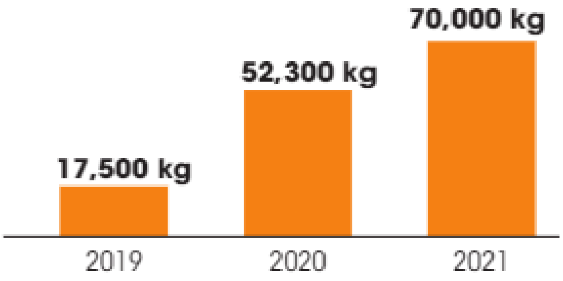
The success so far has been tremendous. In the first year, some 17,500 kg of groundnut was collected from farms. This increased to 52,300 kg in 2020, despite the COVID-19 outbreak, and then to 70,000 kg in 2021. The collective also started trading in 2020, when it sold a little less than 40,000 kg of groundnut in the market. In 2021, it touched 50,000 kg. The annual turnover of the model has also increased from less than ₹10 lakh initially to ₹30 lakh now. In fact, in 2021, they made their first profit of ₹4.27 lakh, which was distributed among the members as bonus and was used to invest in business expansion. The collective has recently installed digital services to scale-up activity. It has installed screens to monitor the rates at various *mandis*, and improve communication services between the village collection centres. Those in-charge of the village collection centre have also been issued mobile tablets for uploading real-time procurement data.



Women cleaning groundnuts at the collection centre in Mamonikhurd village in Shivpuri district of Madhya Pradesh

### GROWING POPULAR

The women producer collective in Shivpuri district has seen a four-fold increase in groundnut collection in the past three years



Source: SRIJAN

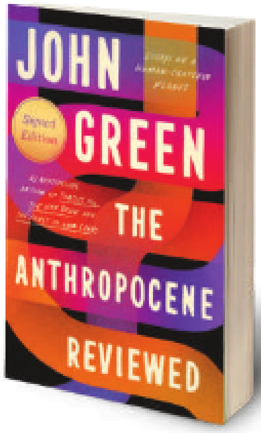
The collective has recently set up a company, Shipre Farmer Producer Company Limited, to process raw groundnuts into different products and directly sell it in the market. It has taken a loan of ₹15 lakh from a non-banking financial company that is also helping them procure storage space and develop market linkages. It also plans to start a business of palash tree gum, used in medicinal purposes, since many of the members are already engaged in its collection. In the last two years, the members have collected and cleaned 4,500 kg of palash gum. The collective is also exploring the possibility of dealing with pulses and mustard in the future, a move that could add 3,500 new members. Its short-term plan, though, is to increase the annual turnover to ₹1 crore in the next three years.

@down2earthindia

# Glorious oversight

AN AUTHOR'S MUSINGS ABOUT AMERICAN POP CULTURE FIXTURES AND PRIVILEGED WAY OF LIFE PRESENTED AS A REVIEW OF THE ANTHROPOCENE

**AVIKAL SOMVANSHI**



**The Anthropocene Reviewed**
By John Green
**Publisher:** Random House Large Print
**MRP:** $30
**Pages:** 432
**Year of publication:** 2021

"MONGOLS ARE the Exception!" was the running gag in a 2012 *YouTube* series titled *Crash Course World History*. It was more ironical than funny because if the writers and producers of the show had actually understood "world" history they would not have labelled Mongols as an exception but as continuation of a culture that developed in a markedly different context and environment than the European empires. Why bring up this West-centric bias in understanding of the world here? The reason is John Green, the producer and anchor of the aforementioned well-produced, adequately hilarious, geopolitically unnuanced *YouTube* series, who has now labelled his musings about American pop culture fixtures and privileged way of life as review of the Anthropocene.

*The Anthropocene Reviewed* is Green's foray into non-fiction. He is otherwise famous as the author of the young-adult best-seller novel *The fault in our stars*. The book is collection of 44 personal essays that cover topics ranging from the mundane ("Sunsets") to the topical ("Plague") to the enigmatic ("Mountain goats") to the alien, at least to the average Indian ("Diet Dr Pepper").

One ought to wonder how these do justice to the book's lofty

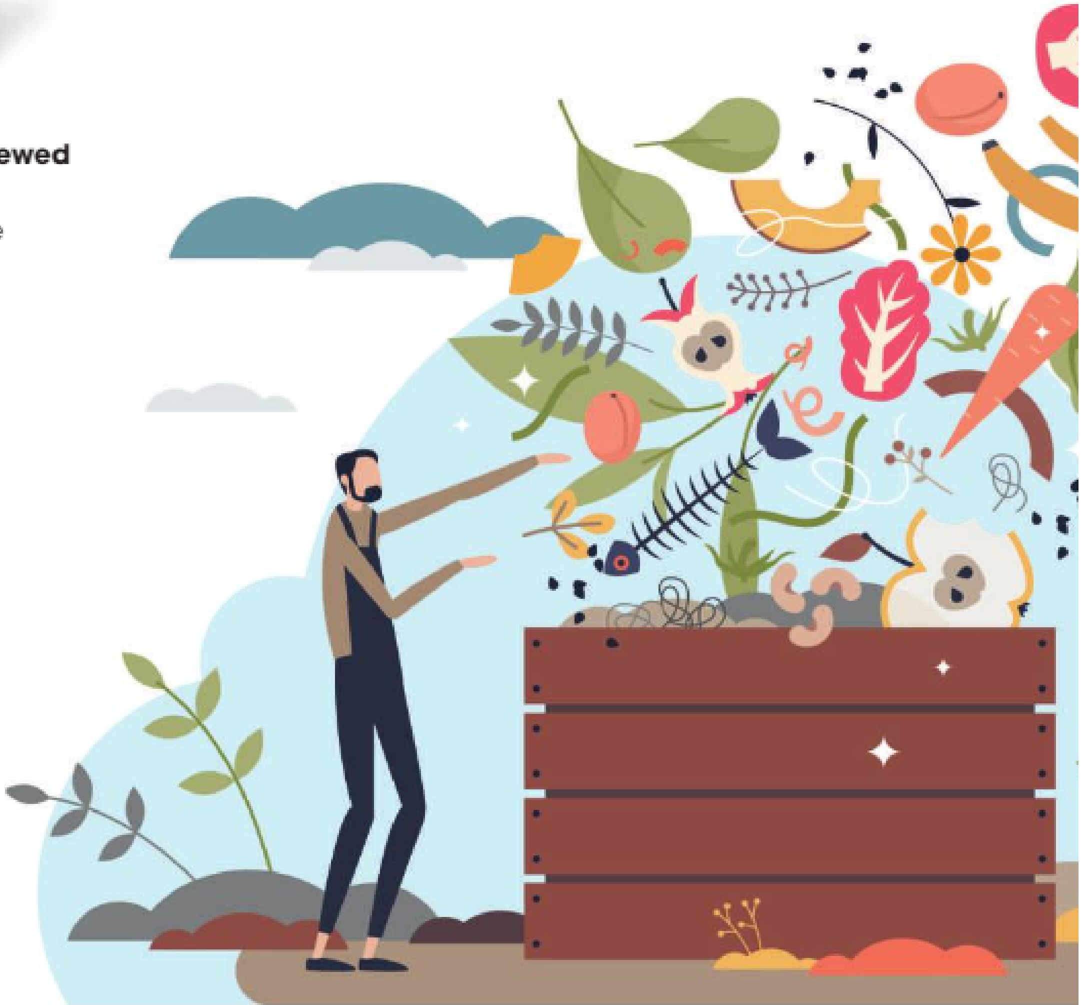
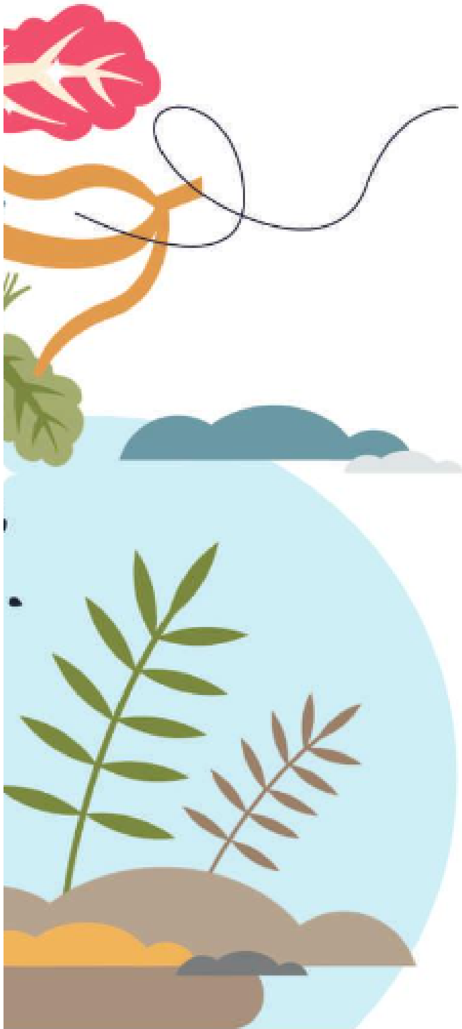


ILLUSTRATION: RITIKA BOHRA / CSE

strapline "essays on a human centred planet". Well, they do not. But they are crafted intelligently to engage the uninformed and the uninterested to maybe start a dinner conversation about themselves. Or at best, make them marginally appreciate some inventions like the internet and vaccines that literally altered the human growth projectile on the planet.

This is achieved by extending tech-obsession with star-rating-scale to human experiences. People have become addicted to rating products, clients, places on the internet and most make their decisions just by referring the simplistic star-ratings. These are not scientific ratings, but Green has cunningly used the online generation's addiction to star-ratings to tell his story (somewhat unfairly though).



**GREEN HAS MASTERFULLY WEAVED ENCYCLOPAEDIC INFORMATION ABOUT HIS ASSORTMENT OF HUMAN EXPERIENCES. BUT THERE ALSO IS THIS CARELESS CARESSING OF GRAVE THREATS TO HUMAN EXISTENCE WHILE DANCING ABOUT FIRST-WORLD EXPERIENCES THROUGHOUT THE BOOK**

Green rates each of the subjects on a scale of five stars at the end of the essay and has awarded a five-star rating to almost 20 per cent of the subjects he has reviewed. All the five-star rated topics are happy experiences like watching the sunset or sycamore trees. None of these are really the doing of human actions or have impacted the planet as implied by the term "Anthropocene". Only three things in his collection get a one-star rating and all three are diseases or disease-causing artefacts—*Staphylococcus aureus*, viral meningitis, and plague. None of the developing world's horrors like malaria, hunger, or poverty are under review in the book.

Written during the 2020 pandemic lockdowns, the essays are an outgrowth of the namesake podcast which Green started in 2018. Green has masterfully weaved encyclopaedic information about his assortment of human experiences, many a time making provident remarks like in the essay on "air conditioning". He notes: "I need to get used to feeling a bit warmer. It's the only future for us."

While reviewing *Staphylococcus aureus*—a round bacterium that happens to be one of the most common causes of bacteremia and infective endocarditis—Green digs deep into the history of antibiotics. It is a fascinating story on its own, even without Green's pondering over philosophical question "why life wants to be". What stands out is a passing mention that "antibiotic resistance is not a problem for the future-this year, some fifty thousand people in the U.S. will die of Staphylococcus aureus infections." Now that is something of real concern in the Anthropocene—the ability of the smallest of organisms to evolve to neuter threats to their survival. Something which the variants of COVID-19 in past two year have effectively demonstrated.

This careless caressing of grave threats to human existence while dancing about first-world experiences is a constant in all the essays of the book. I am not sure if this was intentional. Still, the book makes for an interesting read. In fact it is very easy to miss these dire observations while leisure-reading this well-produced, adequately hilarious and passive bragging. But for a concerned human there is ample to actually ponder about, especially the fact that so many of us think of these mundane subjects as defining feature of human's impact on the planet.

While reviewing "Hiroyuki Doi's circle drawing", which got a four-star rating, Green writes "…I was trying to realize some ideal form that I have in my head of what my signature looks like, and I can never quite achieve it". The sentence is a brilliant and succinct review of his own book. Honouring the "brilliant" five-star-rating-scale theme, I give *The Anthropocene Reviewed* three-and-a-half stars, which also happens to be Green's average rating of things in the book. DTE

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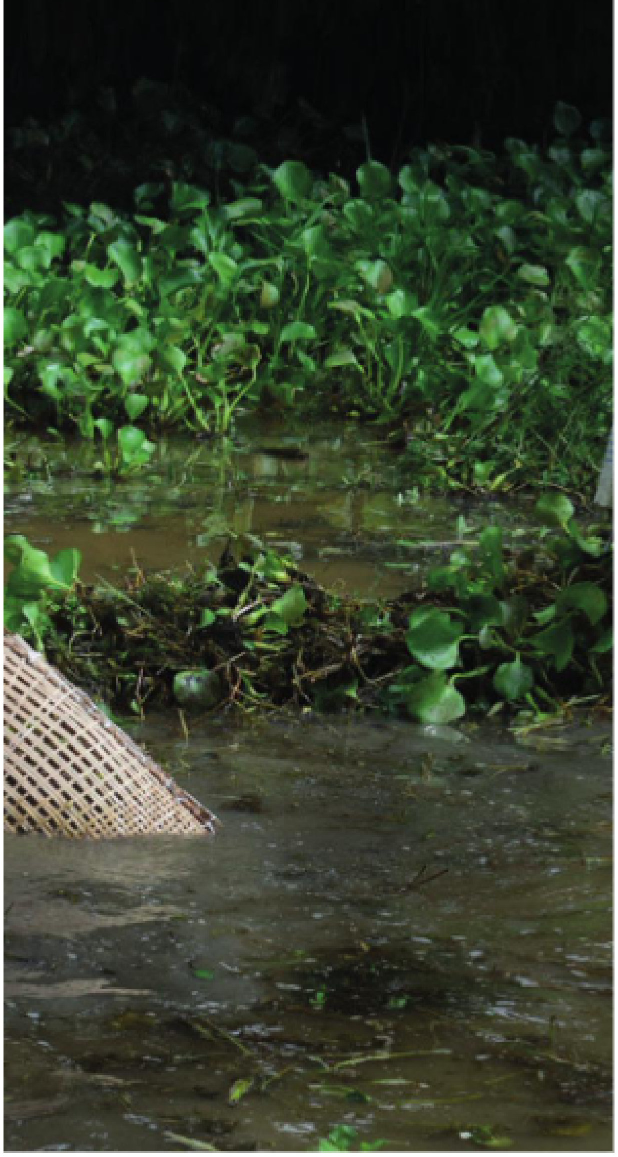
# NET GAIN

In its journey to the Bay of Bengal, the Brahmaputra carves out different types of waterbodies along Assam's landscape. These include rivers, streams, wetlands, creeks connecting the wetlands to rivers, and innumerable ponds, which offer ample fishing opportunity. Fishing has, therefore, been a way of life for the local communities, such as Kaibarta, spread across the state. Today, however, they are perplexed by the changing nature of waterbodies. Fishers say unpredictable and extreme rainfall patterns are causing fluctuation of the water level in streams and rivers and such changes affect migration and other behavioural traits of fish across the waterbodies. Their observations are corroborated by studies, such as "Mapping India's Climate Vulnerability" by the Council on Energy, Environment and Water, released last year on October 26. The study finds Assam to be the most vulnerable to climate impacts in the country. Apurva Kumar Das, joint director-in-charge, Directorate of Fisheries, Assam, says an increased load of sediments in the

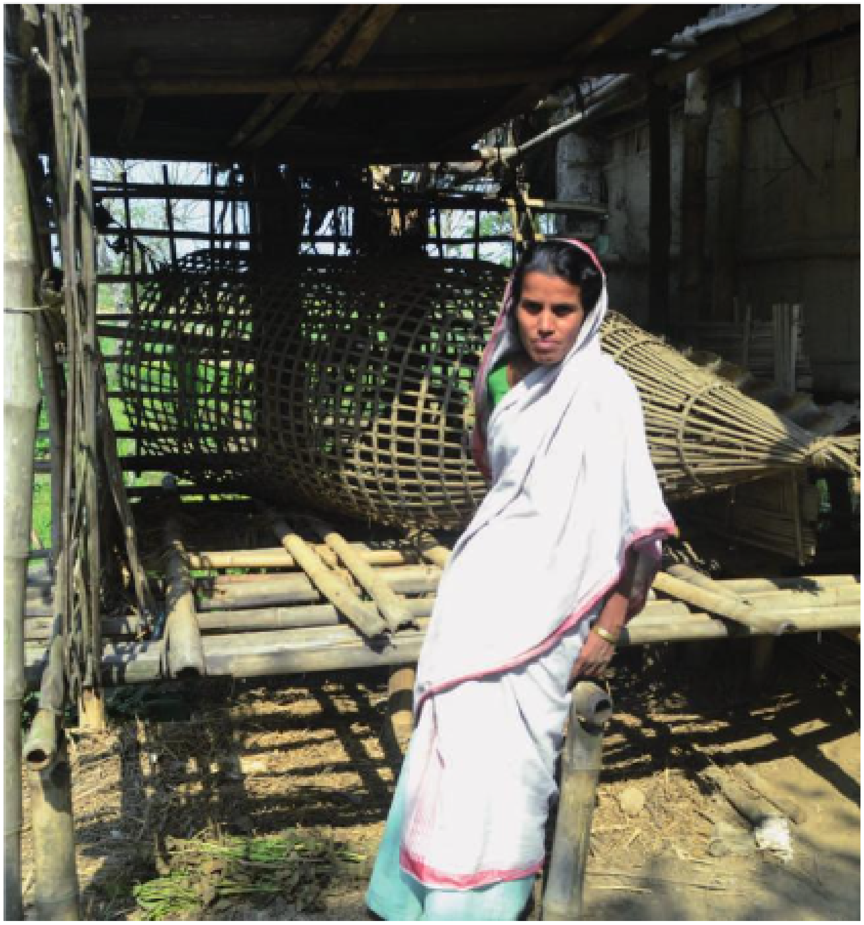
PHOTOGRAPHS: AQUACULTURE, MOUSHUMI BASU



◀ **JAKOI**

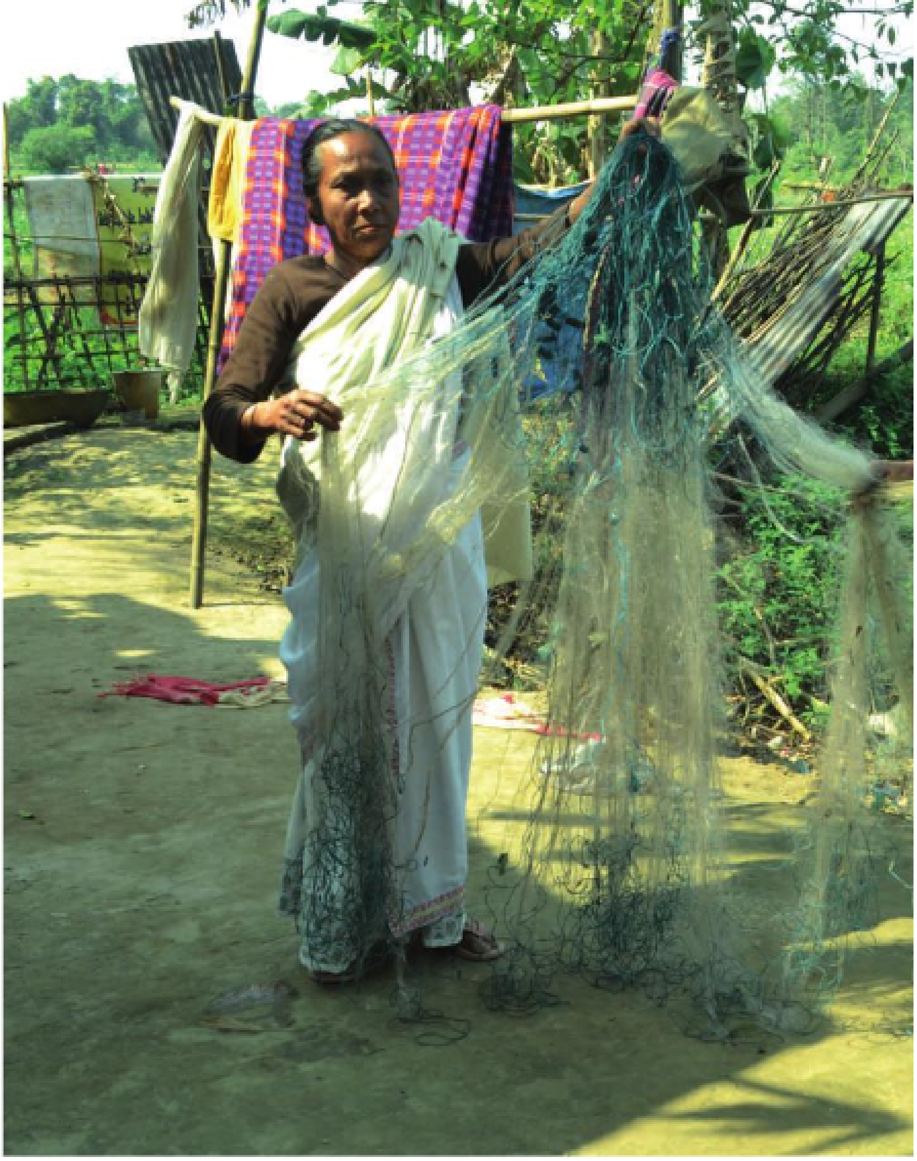
Resembling a triangular basket is the *jakoi* or scoop gear, mostly used by the women fishers. Made of bamboo matting, it is edged with thick splinters that extend as handles. Holding on to them, it is dragged like a shovel along the bed of the waterbody. This churns up the water and the fish entering the basket, apparently to take refuge, get caught. With *jakoi* comes *kholoi*, a bamboo-wickered pot that the women tie to their waist to keep the fish captured during the trip.

Brahmaputra and its tributaries is turning the water turbid and opaque, reducing the dissolved oxygen necessary for aquatic species. Growth of invasive species, such as water hyacinth, is also deteriorating the water quality. Assam's fishing communities are bracing up to these challenges using varied tools—traps, gears and nets—built using traditional knowledge and from locally available resources such as bamboo, cane, jute strings, cork floats and earthen loads. A photo essay by **MOUSHUMI BASU** on how and where these nets of diverse shapes and varying mesh sizes are used.



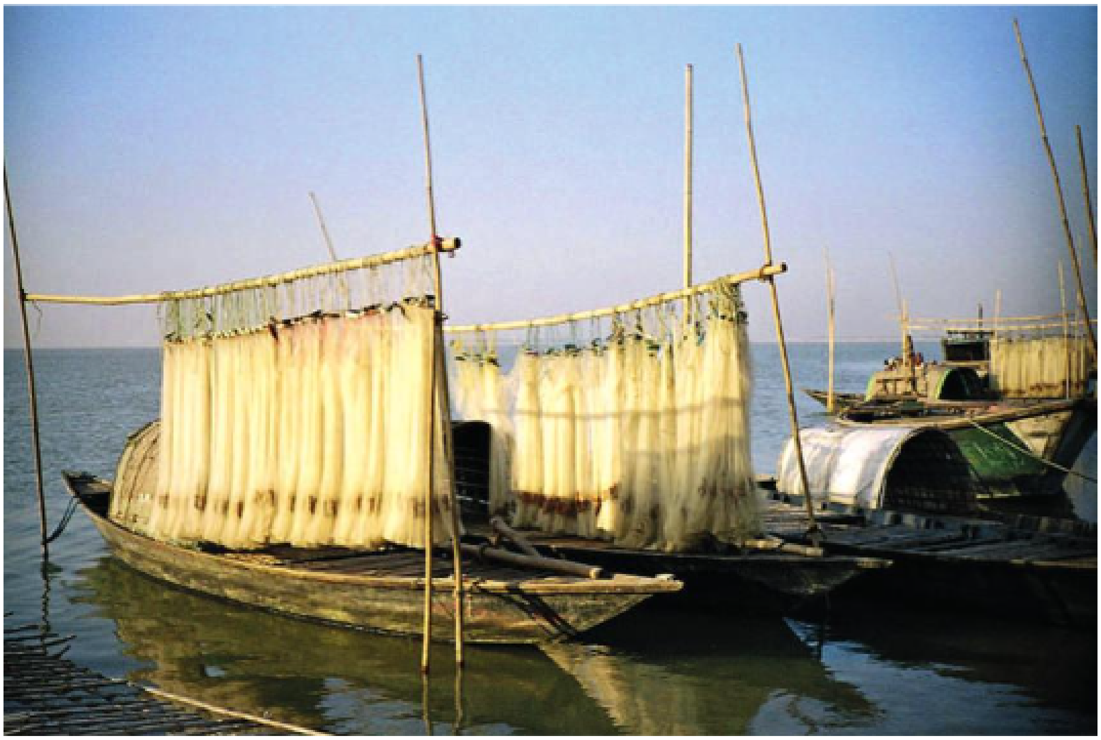
▲ **PAORI**

The tubular *paori* with sizes ranging from 2.5 to 4 m is used in small waterbodies or for fishing in flood water. It is filled up with branches, twigs and leaves of aquatic plants, to lure the fish with a safe refuge and eventually trap them. "The traps are kept concealed in low lying areas under water, tied to bamboo shafts erected at the edge of the waterbody to prevent them getting displaced by the current," says Bharati Das from Changmaigor village in Jorhat district. The catch mostly comprises spiny eels, various kinds of catfish, bronze featherback and small prawns.



## KHEWALI JAAL

This cast net is thrown into the waterbody for encircling a probable fish-bearing area. Small iron weights tied to peripheral pockets stitched at its lower edge, make the net sink into the water. "The apex of the net held through a long chord is tugged now and then and the sinkers (iron weights) disturb the fish. They end up trickling into the net pockets and get caught," say Rathin Das and his sister Maloti from Khurahala village in Majuli district. *Khewali jaal* can be used in multiple types of waterbodies—streams, wetlands and ponds having sufficient depth. The catch includes various commercial fish, such as *chital* (*Chitala chitala*), minor carp (*Labeo bata*) and major Indian carps like rohu (*Labeo rohita*), *mrigel* (*Cirrhinus mrigala*) and catla (*Catla catla*).



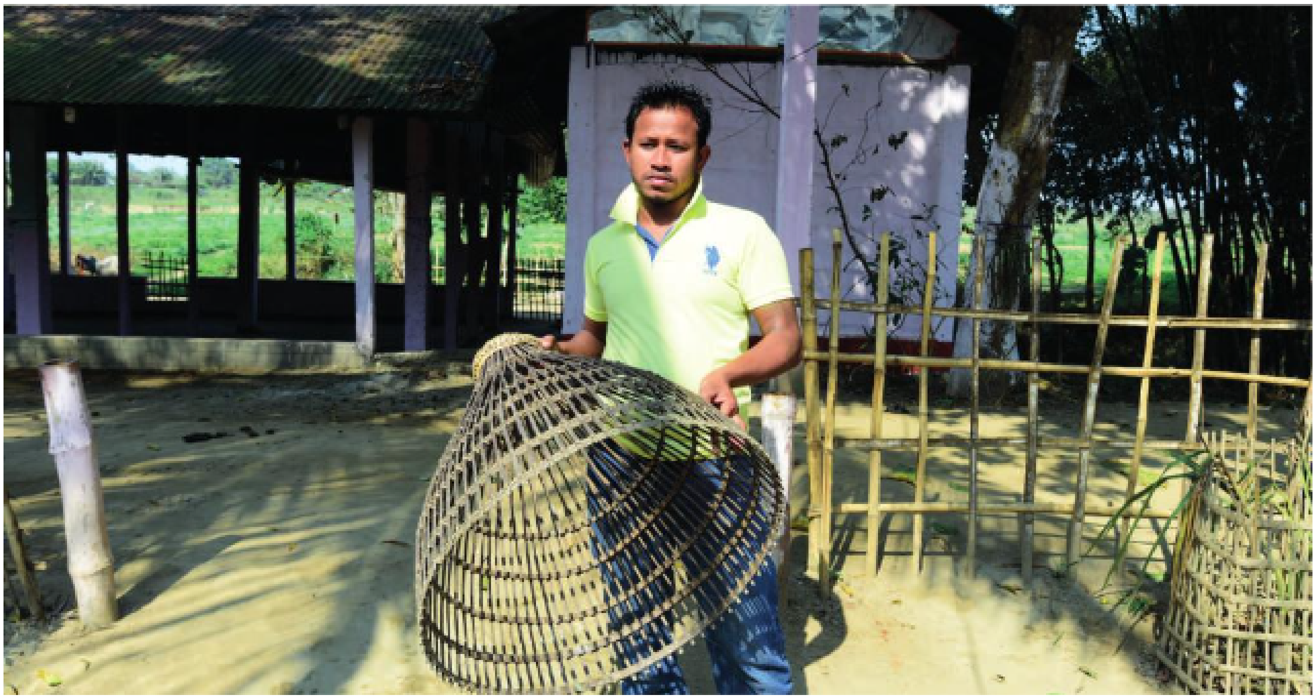
## PHANSI JAAL

This is about 10 m-long wall-like net, placed transversally across large waterbodies. When the fish tries to swim through the "net wall", it gets caught. The size of the mesh just allows the head of the fish to get in and not its body. Then as it struggles to get out, its gills get entangled in the mesh and it appears as though it is hanged (*phansi*) along the net. Such nets are often left overnight in the waterbody.

PHOTOGRAPHS: AQUACULTURE, MOUSHUMI BASU

## POLO

Resembling a plunge basket of about 0.5-1 m tall, *polo* is made of thin bamboo strips, kept open at both ends. The circular bottom is wide but the top opening is much smaller, lined with a thick rim. "Holding on to it, the fisherman slowly wades across the waterbody and sensing the presence of fish below, quickly plunges the gear, pressing the upper rim firmly against the bed of the waterbody. If fish get trapped within, they are taken out through the opening at the top," says Pinku Das from Changmaigor village in Jorhat district. *Polo* is used for a quick catch of fish such as *murrel*, featherback or small carps from shallow water.



*(Research and reporting for the story have been supported by the National Geographic Society)*

**CIVIL LINES** / RICHARD MAHAPATRA

# The anti-incumbent cow

In late 2017, the news from Uttar Pradesh included stories of people describing their night-long vigils against cows raiding their farms; or of someone fracturing his hand while chasing a cow away; or of a farmer taking a cut in his profit to put up barbed wire to protect standing crops from cows. That was the year the incumbent state government came to power, and its first major campaign involved shutting down "illegal" slaughter houses and launching a massive cow protection drive. Bruised by the anti-cow slaughter laws and widespread vigilantism, cow rearers simply abandoned their animals. Instantly, the cow economy collapsed, and another menace emerged.

Uttar Pradesh will see elections to the state Legislative Assembly from February 10. The ruling Bharatiya Janata Party government, which termed cow protection a major achievement in its initial years, faces a strong adversarial electoral issue: the menace of stray cows disrupting the state's farm economy. As the "20th Livestock Census-2019 All India Report" shows, Uttar Pradesh has reported an exceptional increase in stray cow population at 17.34 per cent; the overall number in the country has reduced by 3.2 per cent.

The shift from making the cow the axis of a farmer's economy to abandoning the animal is much bigger than people would usually allow. But with fear and the imminent burden of maintaining non-milking cows (trade in cattle for non-agriculture purposes is banned) leading to more abandonments, the state is overwhelmed with stray cows. Now, they are found everywhere, be it rural or urban areas, and even come back to raid the same farmers' crops they once reared on.

The Election Commission of India has restricted big rallies and road shows ahead of these polls due to the threat of COVID-19. One can argue that as candidates hold small shows with limited audiences and deploy campaign vans across the state, they face more stray cows than people. Moreover, management of the stray cow population itself has emerged as a major election issue. The switch from big rallies addressed by leaders (that play a major role in garnering votes) to small campaigns (that involve closer contact with voters) has enabled the public to confront candidates on local issues. And the stray cow menace has fast emerged as the issue that voters want candidates to address.

Strangely, the issue that the incumbent government took pride in addressing has come back to haunt it as an anti-incumbency factor. In the last five years, the state government responded to the stray cow crisis by declaring the creation of cow protection shelters to appeal to people to adopt them. It also levied a cess to put the cattle in shelters and penalised people for abandoning them. Last November, in a desperate decision, the government announced that "cattle catchers" would be deployed in rural areas to put the cows in shelters. But, with the state already having 1.18 million stray cattle and more being added day by day, this is simply not manageable. Local people see this as the state government failing to ensure their livelihood twice: first because of the collapse of the cattle economy and second, with the stray cows hurting them by damaging crops and necessitating more investment to protect farms.

**The stray cow menace in poll-bound Uttar Pradesh haunts a government that once took great pride in its cattle protection measures**

This election is unconventional, due to both the pandemic-related restrictions and the emergence of the cow menace as an electoral issue. India's electoral history does not have the evidence to show whether cow protection measures have helped parties win. But the current elections in Uttar Pradesh may prove to be an example of whether adverse tinkering with the cow economy could lead to electoral losses.

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## SMALL & MEDIUM SCALE INDUSTRIES

# HOW TO REDUCE EMISSIONS AND INCREASE CIRCULARITY

**Date:** March 9 - 12, 2022 I **Last date to apply:** February 25, 2022

**Course fees:** The course offers full scholarship for shortlisted participants. Scholarship entails Lodging, Boarding & Training Kit fee. It does not cover travel cost from your respective location to Delhi and back.

**Venue:** Anil Agarwal Environmental Training Institute
**(Only shortlisted participants shall be informed)**

**Participants will be awarded Certificates on completion of the Training**

Industries in India are currently facing major challenges with respect to air pollution, greenhouse gas emissions and lack of circularity in their processes. The large scale industrial sectors have been the center of focus being lesser in number which translates into lesser monitoring for the small and medium scale industries by regulatory agencies which are overwhelmed due to limitation of resources. However in the recent years small and medium scale sector industrial sectors have been attracting attention as many source apportionment studies have highlighted them as major source of air pollution . Majority of these industries are dependent on dirty coal as their fuel. Because of inefficient technology, huge amount of coal is burnt causing air pollution and greenhouse gas emission. If environmental performance of small and medium scale industries has to be improved innovation in practices is required such as cleaner fuel, circularity of waste, cleaner technology are the need of the hour. Small and medium scale industries are a source of employment for a large number of people which cannot be neglected as a fact and therefore these sectors require capacity building and support from government and regulatory authorities.

Realizing the significant role MSMEs are playing in the economy of the country and how important it is for them to keep operating in a long term sustainable manner, CSE is organizing a four days training programme on "Small and Medium Scale Industries : How to Reduce Emissions and Increase Circularity". The aim of the programme is to build capacity of the participants on tools to improve the environmental performance of small and medium scale industries. The course will expose its participants to some of the best practices happening in the small and medium scale sectors in the country with respect to both emission control and circularity.

### Who can apply?

- Experts and consultants working with small and medium scale industries
- Non-government organisations
- Independent researchers and academicians working in the field of industrial air pollution and resource efficiency.
- Professionals working in the field of industrial circularity
- Regulators and government officials
- Industry owners and employees

### Learnings from the programme

- Cleaner fuel switch in small and medium scale sectors
- Improving efficiency of combustion equipment
- Concept of common boiler
- Air pollution control devices for small and medium scale sector and its cost viability
- Best Practices in small and medium scale industries
- Making small and medium scale sectors resource efficient through reuse and recycle
- Management of non-hazardous waste from small and medium scale industries
- Class exercise and presentation

### COURSE COORDINATOR

**PARTH KUMAR**

Deputy Programme Manager, Industrial Pollution Unit, **For any queries email** at parthkumar@cseindia.org; + 91 9839061000

R.N.I. NO. 53588/92 POSTAL REGN. NO. DL(S)-17/3109/2021-2023
ISSN 0971-8079. Licensed to Post without Pre-payment U(SE)-44/2021-2023 at Lodhi Road HO,
New Delhi-110003. Published on 14-15 every month. POSTED ON: 16-17 of the same fortnight, Total pages: 60

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